RAILROAD GAZETTE

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CONTENTS

The Performance and Design of Locomotives.*

BY A. VON BORRIES.

I.—RESISTANCE TO MOTION.

Resistance to the movement of a train at uniform speed, which the locomotive has to overcome, consists of that due to grades and curves as distinct from that otherwise presented, which latter may be termed simply "running" resistance. Ordinarily, these resistances are expressed as so many pounds per ton of train weight. In bringing the train to a certain speed the locomotive has to perform, besides this, an amount of work equal to the ultimate *vis viva* of the train. The *running resistance*, which consists of journal friction and of rolling friction between wheels and rails, and more especially of the resistance of the air, has been so much reduced in the course of time by improved lubrication and increased train weight that the old formulæ give too great values.† The oldest and simplest formula, that of Clarke, after being modified to suit present practice, is as follows:

$$W = 5.33 + \frac{V^2}{173}, \qquad (1)$$

in which W is the running resistance in pounds per ton (of 2,240 lbs.) traction, and V the speed in miles per hour. This formula is graphically shown in Fig. 1 by curve C. For speeds greater than 44 (70 km.) miles per hour it gives too large values. Ordinarily speeds above 62 (100 km.) miles per hour can be attained but rarely, on account of excessive resistances. On French railroads Chief Engineer Desdouits determined, by several carefully conducted experiments with three different types of locomotives, in their usual working condition and run at low speeds, the following frictional resistances:

	Weight including tender. Long tons.	Resistance with connecting and eccentric rods. lbs. per ton.	Resistance without connecting and eccentric rods. lbs. per ton.
⅔ coupled pass. loco....	52.83	7 17	5.26
" freight loco.	48.76	8.06	5 64
" " "	71.12	8.96	6.94

Taking down the side rods had little effect. The tender alone produced 5.6 to 6.27 lbs. per ton resistance, and cars of different description from 3.36 to 3.58 lbs. per ton. Curve L in Fig. 1 describes the resistance of the passenger locomotive with tender; curve W_1 that of a train consisting of eight, 2-axle passenger coaches each weighing about 10 tons, while W_2 is for an equivalent train of three, 4-axle cars with pivoted trucks (Drehgestellwagen) each of about 27.5 tons weight. These three curves are remarkable in that, at high speeds, they closely approximate right lines drawn from the origin. We can conclude, therefore, that at high speeds the resistance increases rather as V than as V^2.

These experiments proved, furthermore, that wind resistance is greatest on the first car, less on front surfaces of cars, which project above preceding cars, and least, but still very appreciable, on the front end surfaces of every other car in the train. The difference in the number of these surfaces in proportion to the weight of the train accounts for the difference in resistance recorded by W_1 and W_2.

Frank, in his experiments, likewise established these influences and attempts to account for them, fully, in

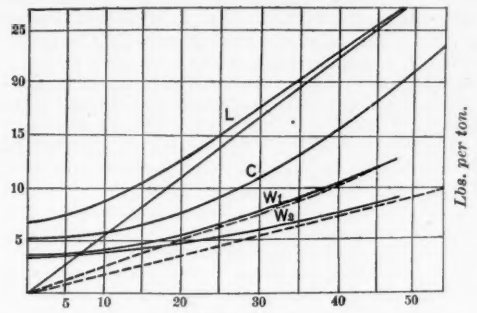


Fig. 1.

his resistance formula ("Organ f. d. Fortschritte des Eisenbahnwesens," 1885-6).

$$W = \frac{1}{L + W}\left[a\,L + 2.5\,W + (b + c)\frac{V^2}{1{,}000}\right] \qquad (2)$$

L is the weight of locomotive and tender; W, the total weight of the cars, both in tons (1,000 kg.)

a, the "external" frictional resistance per ton of locomotive, approx. equal to 3.2 kg. per ton and 3.9 kg. per ton for the ⅔ and ⅔ coupled locomotives respectively;

b, the advancing cross-section of the locomotive in square meters, assumed to be 8. (86 sq. ft.)

c, a sum total of the surfaces in square meters exposed to wind resistance by the cars in the train, which are taken as follows:

Baggage cars each 1.7 sq. m. (18.3 sq. ft.)

Passenger or covered freight cars, each .5 sq. m. (5.4 sq. ft.)

Empty open cars, each, 1 sq m. (10.7 sq. ft.)

Loaded open cars, each, .4 sq. m. (4.3 sq. ft.)

Passenger or other covered car following an empty open car, 1 sq. m. (10.7 sq. ft.)

This formula considers very fully the effect of the special composition of each train, but as it is also based on the assumption that wind resistance varies as V^2 its results will be too large.

For the purpose of estimating locomotive performance, coal consumption and the like, Clark's formula is sufficiently accurate. It is to be seen in the figure that the heavier the locomotive in proportion to the train and the higher the speed, the closer curve C approximates L and the farther it departs from W_1; that is to say, the heavier the locomotive the better the formula will apply. Results so determined have agreed very well with those obtained with indicator and dynamometer in several experiments performed on the Prussian State Railroads. In fact, for low and medium speeds there was perfect agreement, but for high speeds, with the same train, the calculated resistance was always too large.

The resistance of trains of four-axle cars is better determined by means of curves L and W_2. Running resistance is affected by the direction and force of the wind, being considerably increased by a strong side wind, which strikes the advancing surfaces of all the cars with undiminished strength. Therefore the total effect of the wind is less in case long cars compose the train, and is least when the intervening spaces between are closed by the "bellows joint" to prevent the wind blowing through. Severe cold influences frictional resistances, particularly by increasing journal friction.

II. THE PERFORMANCE OF LOCOMOTIVES.

The work of a locomotive is made up of four operations, viz.: fuel cumbustion, evaporation of water, utilization of the steam pressure and traction. Its performance, as a whole, is governed largely by the least efficient, at the time, of these operations; in fact, the limits to its performance are established by the effective limits of that particular operation. The design of a locomotive will be generally best suited to its special service if the four operations not only work together in effective agreement, but avoid as much as possible great variation in individual efficiency.

Since combustion depends almost entirely on the blast produced by the exhaust, the more uniform it is the better, and the more heat will be created; a result which follows only when the exhausts are comparatively gentle and rapid. Irregular combustion, caused by strong blasts following one another at marked intervals, impairs the process, for, as first too much and then too little air is drawn through the fires, complete chemical action is prevented. Since gentle blasts following one another rapidly are due to an early cut-off and high speed, while the contrary circumstance produces strong and intermittent blasts, it follows that the efficiency of combustion increases with the speed.

Speed also influences evaporation, for the conduction of the heat of the gases of combustion to the water through the walls of the heating surface is assisted, in conformity to known laws, by the high temperature of the gases and their uniform flow through the flues and retarded by lower temperatures and varying draft. Therefore, the quantity of steam generated increases with the speed within limits set by the two operations, combustion and evaporation. Likewise the utilization of the steam pressure in the cylinders varies with the speed within certain limits, for as the cut-off diminishes the degree of expansion increases. The ordinary locomotive works most advantageously at 15 to 20 per cent. cut-off; if the speed corresponding to this cut-off is exceeded the cylinder will use more steam than is actually necessary for the performance of its work; there must be, then, either a shorter cut-off or a lower initia pressure, which in itself would result adversely. The resistance to the discharge of the steam through the exhaust passages becomes very sensible at high speeds. So that, in general, the efficiency of locomotives varies with the speed within limits fixed by the maximum effectiveness of the four component operations. The maximum efficiency is attained at speeds rarely reached in practice.

In Fig. 2 are graphically represented the performances,

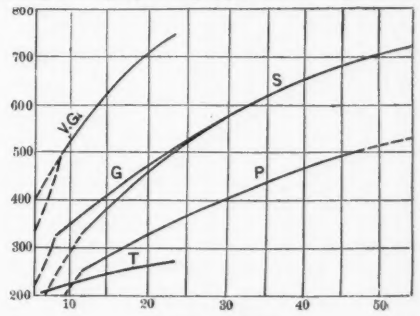


Fig. 2.

at different speeds, of five locomotives of different classes belonging to the Prussian State Railroads, the abscissæ being speeds in miles per hour, the ordinates, the corresponding horse-power developed. The principal dimensions of these locomotives are tabulated herewith,

PARTICULARS OF CERTAIN PRUSSIAN LOCOMOTIVES—VON BORRIES.

Symbol.	Description.	Grate surface, sq. ft.	Heating surface, sq. ft.	Cylinder. Diameter, in.	Cylinder. Stroke, in.	Driving Wheels. Diameter, in.	Driving Wheels. Wt. on, tons.	Boiler pressure lbs. per sq. in.	Ratio heating surface to grate surface.
		R	H	d	h	D	L	p	$\frac{H}{R}$
S	⅔ coupled high speed locomotive.....	24.5	1,270	16.9	23.6	78.	30.5	176	55
P	⅔ coupled passenger locomotive.....	18.8	1,040	16.5	22.	68.	25.	147	53
G	⅔ coupled freight locomotive.	16.5	1,346	17 7	24 8	52.3	39.1	147	82
VG	⅔ coupled freight locomotive. (compound).....	25 6	1,550	{20.8 / 29.5}	24.8	49.2	50.8	176	63
T	⅔ coupled tank locomotive....	14.	646	13.8	21.6	42.5	30.0	176	47

The grade resistance is $2.24S$ lbs. per ton train weight, when the grade is S ft. per 1,000. In descending the grade this force, of course, assists the motion.

Curve resistance, according to Röckle's formula, which is based on the experiments of the Bavarian State Railroads, is $\frac{4{,}800}{R - 180}$ lbs. per ton (2,240 lbs.) train weight, R being the radius of the curve in feet.

The total resistance will be, therefore,

$$W = 5.33 + \frac{V^2}{173} + 2.24S + \frac{4{,}800}{R - 180}$$

The useful effort of a locomotive at the circumference of the wheels will be

$$N = \frac{W\,G\,V}{375} = \frac{Z\,V}{375}$$

Where N is in horse-powers, Z is the total traction at the wheel circumference, in pounds, and G the total weight of the train in tons (2,240 lbs.).

These performances have been determined from extensive observations in actual service, and in one case, locomotive S, from a series of carefully conducted tests. In the calculation of the performance, Clarke's formula was used to find the running resistance of the whole train from the accelerated trainloads, so that the running resistance of the locomotive was considered as additional cars and quite distinct from its internal resistances. The curves therefore give the useful effort in horse power at the circumference of the driving wheels.

The performance, it is to be seen, increases rapidly from the lowest limits of the speed, which corresponds to a complete utilization for traction of the weight on drivers. For locomotive S, between the speeds of 12.5 and 56 miles per hour, the performance increases from 330 to 715 H. P. or, about 216 per cent.; for P, between 12.5 and 50 m. p. h., from 250 to 500 H. P. or double; for

* These articles are extracts from an important work, "Die Eisenbahn-Technik der Gegenwart," selected and translated for the *Railroad Gazette* by Mr. W. W. Nichols, Instructor in Mechanical Engineering in Yale University. Mr. Von Borries, as very many of our readers know, is Mechanical Chief of the Hanover "Direction" of the Prussian State Railroads.

† See "Die Mechanik des Zugs-Verkehrs von Goetkowski," Vienna, 1891, for a complete collection of old and new formulæ with their results.

‡ ⅔ signifies a total of three axles, two of which are coupled, i. e. driving axles, etc.—TRANSLATOR.

G, between 9.5-25 m. p. h., from 330 to 510 H. P., or about 52 per cent.; for $V\,G$, between 10-25 m. p. h., from 500 to 750 H. P., or about 50 per cent.; for T, between 7.5-25 m. p. h., from 210 to 280 H. P., or only about 32 per cent. For higher speeds the performance in each case soon reached a maximum, and then decreased as the speed increased. Since Clarke's formula gives too great values—at high speeds—to the resistances, probably the performances of locomotives S and P at speeds exceeding 45 m. p. h. are too high. In reality the maximum would be attained somewhere near 50 m. p. h. for the former and 43.5 m. p. h. for the latter.

Fig. 3 shows graphically the individual performances

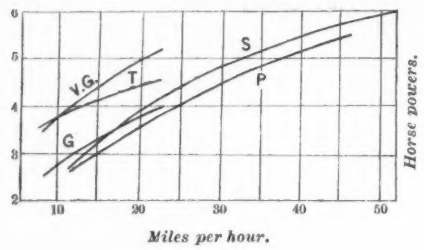


Fig. 3.

per square foot heating surface. Here curves S, P and G lie pretty close together; $V\,G$ considerably above them, in consequence of compound expansion and its proportionately larger grate surface; T, because of its proportionately larger cylinder and grate surface and smaller wheels, is at first with $V\,G$, but rises little as the speed increases.

Since combustion, as already noted, depends less upon the speed of the train than upon the number of revolutions per second of the drivers, the curves of Fig. 4 exhibit best of all the effectiveness of the design, for they describe the performances (in horse power per square foot heating surface) in terms of the driver speed. Curve S, because of its higher boiler pressure, lies above curve P and would lie still higher for the lower speeds if its

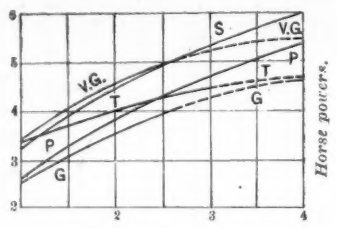


Fig. 4.

cylinders were larger. When the revolutions exceed three per second the values given by S are probably too high, for reasons already stated. G, on account of its smaller grate surface, remains below P. $V\,G$ lies highest of all, because of compound expansion and large grate surface. T begins well by reason of its larger cylinder and grate surface, but at higher speeds the adverse action of the exhaust prevents its rising but little more. The common method of handling this kind of locomotive has, in all probability, the same effect.

In addition to the foregoing the following table, which contains the performances, etc., of several locomotives, is presented. $\frac{C}{H}$ is the ratio of the volume of the cylinders in cubic inches (the high pressure in compound engines) to the heating surface, H the heating surface, R the grate surface, p the boiler pressure. Columns 5-11 give the horse power* per square meter (about 10 sq. ft.) heating surface developed at the speed given.

1	2	3		5	6	7	8	9	10	11
Description.				Number of revolutions per sec.						
Passenger and high-speed locomotives.	$\frac{H}{R}$	p lbs. per sq. in.	$\frac{C}{H}$	1	1.5	2	2.5	3	3.5	4
(1) Single expansion	55	176	4.27	3.5	4.1	4.7	5.1	5.5	5.8	6.
(2) Compound	55	176	4.85	3.5	4.4	5.2	5.9	6.3	6.7	7.
Freight locomotives:										
(3) With small grate surface	80	147	4.56	2.6	3.1	3.6	4.	4.2	...	..
(4) With large grate surface	60	147	5.13	3.	3.6	4.1	4.5	4.8	...	..
5) With small grate surface (compound.)	75	176	5.7	3.	3.6	4.1	4.5	4.8	...	..
(6) With large grate surface (compound)	60	176	5.7	3.3	4.	4.6	5.1	5.5	...	..
(7) Tank locomotives	50	176	5.02	3.4	3.8	4.1	4.3	4.5	...	..

*The H. P. is the German H. P., which is about .98 of the English H. P., so nearly the same value that no change in this particular has been made.

The following notes supplement this table:

1. The performances tabulated were attained under the use of good "locomotive" coal. They could have been improved 10 per cent. with the best coal and correspondingly lessened with poorer coal.

2. Higher boiler pressures give higher efficiencies.

3. At low speeds the performances increase with $\frac{C}{H}$ and diminish at higher speeds as $\frac{C}{H}$ is increased.

4. The performance can be considerably improved by increasing simultaneously the boiler pressure, $\frac{C}{H}$ and the degree of expansion in the case of compound engines, combined with the use of good coal. This has been demonstrated in the case of a high-speed locomotive, which developed with ease 900-1,000 H. P. at speeds of 45 to 53 m. p. h., or 8-9 H. P. per square meter H. S.

5. All these results are based on the methods of calculation aforementioned. The boiler performance is the result of continental practice, which secures a vacuum in the smoke arch of from 3 to 4 in. water. In England this is increased by using the superior coal of that country; in America by a stronger exhaust.

6. Finally, it is to be noted that details of design, particularly in the valve motion and the exhaust apparatus, have considerable effect on the performance.

7. Better performances on heavy grades, which require not over 10-15 minutes to ascend, can be obtained if opportunity be given beforehand for the preparation of the fire and subsequently to restore the water level.

The Gas Engine and its Mission.—II.

BY PROFESSOR SIDNEY A. REEVE, WORCESTER POLYTECHNIC INSTITUTE.

(*Continued from page 2.*)

APPLICATIONS.

According to Schaefer, whose little book* is almost the only attempt at information in this line, the distribution of 2,323 gas engines throughout 36 representative German cities lies between the various industries as follows, the figures being percentages of the whole number. As these cities range in population (1890) from 3,000 to 348,000, with an average of 68,000, they are excellently illustrative:

Industry.	*Percentage.*
Printing and lithography	14.4
Pumping	8.6
Textile	7.9
Electric lighting	7.6
Machine shops	5.3
Joiners and cabinet-makers	5.0
Butchers and sausage-makers	5.0
Locksmiths	4.2
Coffee-roasters	3.1
Cutlery	2.9
Elevators	1.6
Total	65.6

The remaining 34.4 per cent. is scattered throughout 140 more industries. This proves that the gas engine is largely the motor of the small industries; but it should also be remembered that Germany is the land of small industries.

Another lesson to be learned from this list of Schaefer's is more encouraging. Fifty-four per cent. of these engines are to be found in positions which cannot be classed as either "small" or isolated industries, but are in departments of large manufacturing establishments. In other words, more than half of the engines now running in these cities serve, not the small operator because they can be had in smaller sizes than can the steam engine, but rather the large manufacturer because they are valuable for the subdivision of power and its supply in inaccessible localities. This very important fact will be further developed in another paper.

This list also shows an average of one gas-engine for every 1,015 inhabitants. The average size of engine, from a much larger list, is 3.36 H. P. The total number of engines in that country is increasing at the rate of about nine and one-half per cent. per annum, while the total horse-power is rising by over 12 per cent. per annum; this shows a steady increase in average size of 2.3 per cent. per annum. This last figure, however, is hardly a true indication of the increase in size of largest available engine; for the fact that several small engines are always sold to every large one will always force the largest engines to pull up the average only about one-third or one-fifth as rapidly as their own figures rise. As a matter of fact, too, there has been a marked "boom" in gas-engine sizes since this book of Schaefer's was written.

It is unfortunate that we have no accurate data of a corresponding nature for this country. While in Germany, France and England, the reports of the gas companies frequently give the proportions of total gas-consumption going to the three services of light, heat and power, the subject in this country is still apparently regarded by the gas companies as not worthy of investigation, or at least of record.

A similar frame of mind is to be found prevailing among the gas-engine builders and systematic efforts at the collection of statistics are always futile. While some respond most courteously, those who do not are sufficiently in the majority to spoil the result. As a guess from these partial figures it might be said that the average output of gas engines in this country during the past five years amounts to about 20,000 H. P., the average size of engine running between 5 and 15 H. P. A safer conclusion, drawn from a more unanimous report, is that this average size has increased very perceptably within a year or two, and is still rising rapidly. Nearly all builders are now offering engines of from 30 to 40 H. P. A few more have attained the "century size" of 100 H. P., while two houses offer as nearly ready for the market, although they have none actually running, engines as large as 250 H. P.

The question of the application of gas power to average factory purposes stands much in this way:

*Franz Schaefer: "Die Kraftversorgung der Deutsche Staedte durch Leuchtgas." Leipzig: R. Oldenbourg; 1894.

The cost of fuel per horse-power hour for the four species of prime movers,—steam engine, oil engine, gas engine on city gas, and gas engine run on a special gas generator of its own—is about ⅜ cents, 1½ cents, 2½ cents, and ⅛ cents respectively. The total cost of power is another matter, of course, and these figures even for fuel alone can be nothing more than estimated averages of figures which vary widely according to locality and size and load of engine. Still they are fairly characteristic.

It is obvious at a glance that the power purchaser has only one choice on the score of fuel cost, and that is the last. But this is not available unless the factory be large enough to warrant the construction of a gas generator of its own. Now such a generator is not so complex or so costly as the same size of boiler plant, so that the obstacle cannot lie in the size, and yet the system is not widely adopted. According to recent statements of Dr. Chas. E. Emery, "engineers cannot understand why" a system with so low a fuel rate is not nearly universal. The reason is distinct, although two fold: First, such generators have been available, until lately, only in the larger sizes, 100 H. P. and upward, or just the powers in which the gas engine was not available. Further, while successful in good hands, the generators have not been reliable as to quality of gas under all the vicissitudes of "the man with the monkey-wrench."

But more recently they have been extended into the smaller sizes, until now they are on the market as small as 35 H. P., in which size they are about as large, and much less dangerous and delicate in operation, as the same size of vertical steam boiler. In the meantime gas-engine powers have risen, so that between 35 and 100 H. P., at the least, this objection no longer holds.

The real explanation lies in the fact that the gas engine *as a machine* cannot be paralleled with the steam engine. It is in no disparagement of the splendid work done in the development of the engine, nor in anything but faith in the future of the engine, that this fact is pointed out as the most significant one in the whole gas power question.

To be specific, attention should be centered upon the nature of the motive cycle. First, there is no storage of power anywhere except in the moving fly-wheels; secondly, the source of power is not only an explosion—abrupt and excessive in its vigor—but is an explosion which rigidly refuses to be efficient under any except narrowly specified conditions. Finally, it is an explosion which has to be carefully prepared for beforehand.

In short, the system is by nature stubborn and inelastic. There is always difficulty in starting, even with the load thrown off. Small engines are started by setting the fly-wheels in motion by hand. The limit for one man is reached at about 10 H. P.; for any number of men the limit is about 30 H. P. For larger engines the "starting-gears" are many. The majority consist of pumping by hand into a reservoir a mixture of gas and air which is utilized at nearly atmospheric pressure to procure two or more partial impulses, until the fly-wheels have inertia enough to compress a charge and fire it in the normal way. One engine uses blank cartridges inserted into the clearance-space and fired at the proper instant by the tap of a hammer. Probably the most satisfactory method offered is that of maintaining in a reservoir a stock of compressed air by which the engine starts as an ordinary compressed-air motor. After the start is effected, a small compressor is thrown into gear which makes good the loss of air in starting, leaving the reservoir ready for the next start. This method, while the most costly to install, is, I believe, the only one which pretends to start the engine cold under its normal load. With the rest the load must be lightened or thrown off entirely.

The remainder of the difficulties still stand untouched, however. There is no margin of power. While all the early builders, and most of the modern ones, made the mistake of rating their engines at the maximum possible power to be gotten out of them, the more progressive builders now rate their engines at a respectable margin below this figure. But this will not cure the evil; it merely dodges it. To explain, when a steam engine is overloaded it slows down and pulls hard. It not only has a respectable margin above the load of maximum efficiency before it begins to slow down, but it has a further wide margin of useful activity beyond that point before it comes to a full stop, and during which its speed is a ready indicator of how far it is from stopping. With the gas engine, however, the load of maximum efficiency is that of maximum capacity, and any travesty upon a true margin of power obtained by merely putting the rating below this point is directly robbing the user of his proper efficiency. Further, when a gas engine is so overloaded that it once begins to slow down there is no "grunt and pull hard" to it. It balks. It "lays down," as one runner tersely put it; and unless instantly relieved at the first symptom no amount of coaxing will persuade it to get up again. It stops; the entire load must be thrown off and a fresh start made. The fatal effect of any such idiosyncrasies upon many services is too obvious to be mentioned.

The question of crudity of regulation and of badly decreased efficiency under any known means of modulation of power have already been discussed.

As to reversibility, that problem has always been accepted by designers as insoluble, so far as I know; for the types of engine which willingly run in whichever direction they may be started hardly deserve the name of being reversible.

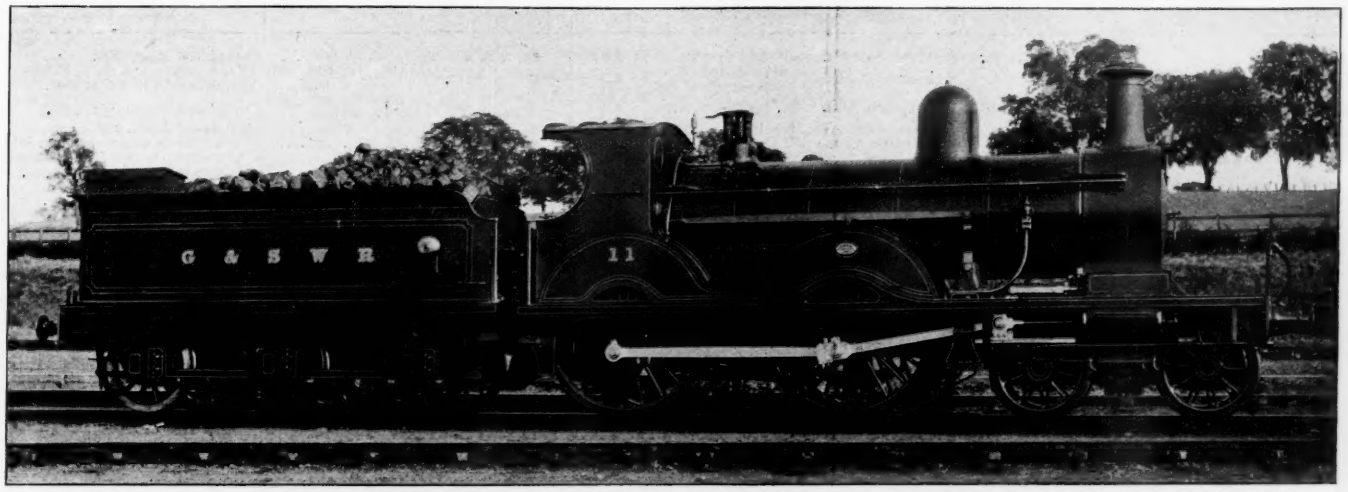
These objections are not perhaps insurmountable. But they have never been surmounted, and their existence must be carefully grasped and appreciated before the gas-engine situation can be understood.

[TO BE CONTINUED.]

Glasgow & South-Western Four-Cylinder Simple Engine.

In a former issue* we gave a brief description of a new locomotive which had just then been placed in service on the Glasgow & South-Western Railway, of Scotland. By the courtesy of the designer, Mr. James Manson, M. I. M. E., Locomotive Superintendent of the road, we are enabled to present herewith a half-sectional plan showing the general arrangement of the principal working parts. The engraving showing the engine in perspective is from a photograph by F. Moore, London.

To a casual observer the exterior of the engine presents no novel features, except the outside valve chest and rod—unusual in British practice—but a glance at the plan view will show how the four cylinders and valve gear

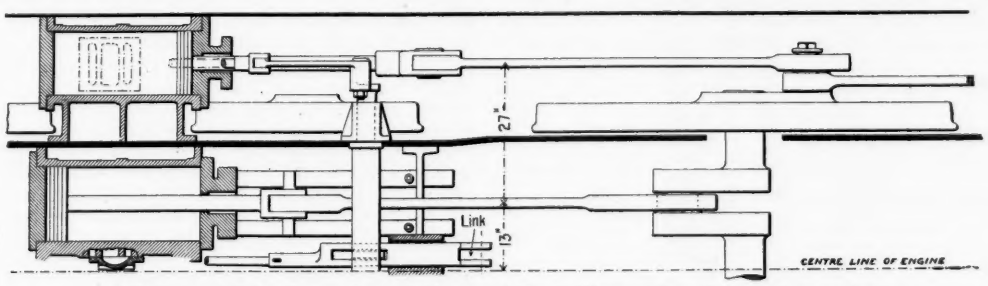


Four-Cylinder (Simple) Express Locomotive for the Glasgow & South Western Railway.

are arranged, and also that the outside cranks are set opposite to the inside cranks; the reciprocating masses thereby balancing each other.

To avoid a complication of working parts Mr. Manson has designed a very simple arrangement of valve gear with only two pairs of eccentrics, these being placed between the inside cranks and connected by the links directly to the inside valve rods, as is common on inside cylinder engines. Each of these inside valve rods is mortised to receive the lower rocker arm of a rocking shaft which extends laterally to the outside, where its upper arm communicates motion to the outside valve rod in the same way as on American engines. It will thus be seen that the outside and inside valves work opposite to each other to serve their respective cylinders. The inside valves are placed between the inside cylinders and are of the ordinary type, but those on the outside are on top of the cylinders and balanced, being fitted with a relief ring or piston.

The engine is not a compound, high-pressure steam being used in all the four cylinders. It was built at the



Cylinders and Valve Connections of Glasgow & South Western Four-Cylinder Locomotive.

company's works, Kilmarnock, and has a remarkably neat and handsome appearance.

We append a list of the principal dimensions:

Cylinders, outside, diameter	12½ in.
" stroke	24 in.
" inside, diameter	14½ in.
" stroke	26 in.
Diameter of truck wheels	3 ft. 7½ in.
" " driving "	6 ft. 9½ in.
Rigid wheel base	8 ft. 9 in.
Total " "	21 ft. 11 in.
Boiler	Steel
" maximum internal diameter	4 ft. 3 in.
" length	10 ft. 6 in.
" thickness of plates	½ in.
" diameter of dome inside	1 ft. 10¾ in.
Firebox casing	Steel
" thickness of wrapper	½ in.
" " " throat plate	⅝ in.
" " " back	⅝ in.
" outside length	6 ft. 2 in.
" " width	4 ft.
"	Copper
" thickness of plates at tubes	1 in.
" " " " sides	½ in.
" " " " back	½ in.
" inside length	5 ft. 6¾ in.
" " width	3 ft. 4 in.
" height at front	5 ft. 11 in.
" " " back	5 ft. 4 in.

* *Railroad Gazette*, Aug. 20, 1897.

" diameter of copper stays	1 in.
" number " " "	671
Tubes	Brass
" number	238
" length between tube plates	10 ft. 9⅛ in.
" outside diameter	1⅝ in.
" thickness at firebox end	11 S. W. G.
" " smokebox end	12 S. W. G.
Heating surface—in firebox	111 sq. ft.
" " " tubes	1,094 sq. ft.
" " total	1,205 sq. ft.
" " Grate area	18 sq. ft.
Working pressure per square inch	165 lbs.
Weight in working order—on the trucks	17 tons
" " " drivers	31 tons 14 cwt.
" " total	48 tons 14 cwt.
Tender—diameter of wheels	3 ft. 10½ in.
" total wheel base	12 ft.
" capacity of tank	2,500 gals.
" " fuel space	200 cu. ft.
" weight in working order	32 tons 5 cwt.

Track Elevation in Chicago.

In our issue of March 15, 1895, will be found a general summary of the work done up to that time in the matter of abolishing the street crossings at grade in Chicago. In this article a brief description was given of the early movement and the causes which led up to the final adoption by the city officials of a policy to treat the railroads as fairly as possible and consider each road as a separate engineering problem requiring special study. While this would seem to be the only rational policy, yet it was the last to be adopted by the city. A brief review of the facts as given in the article referred to may be of interest.

About 20 railroad companies own and use rights of way into the city of Chicago, and it is estimated that there are about 1,200 miles of steam railroad tracks within the city limits. There are no topographical features to require the grouping of railroad lines in certain localities, but the roads come in from every direction; the earlier roads were built on reasonably direct lines, while those that came in later were largely controlled in the choice of a location by the price of real estate, in some cases making wide circuits around the outskirts before aiming at a terminal. With the growth of the business of the railroads and the rapid increase in the population of the city, a very complicated condition was brought about, and the separation of the street traffic from that of the railroads at crossings became an important question in which the railroads as well as the city were interested. The first move to accomplish this separation was building costly viaducts to carry the more important streets over the railroad tracks. In all 39 viaducts were thus built, but these high viaducts were soon objected to on account of the steep grades formed in the streets.

In July, 1892, a committee, appointed by the Mayor to examine and report on all roads entering Chicago on grade crossings, recommended that all railroad tracks be removed from the area bounded by Canal street on the west, Kinzie street on the north and Twenty-second street on the south, and that all other tracks be elevated sufficiently to clear all streets. Following this report, the City Council on Feb. 24, 1893, passed what has become known as the O'Neil ordinance. This ordinance provided that in the central district of the city, about one mile square, from the river south to Park Row and Twelfth street, all railroad tracks west of the Illinois Central road should be elevated to a height of 18 ft. above city grade; the work to be commenced by July 1, 1894, and completed by July 1, 1895. In the second district, bounded by Sixty-seventh street on the south, Kedzie avenue on the west, and Diversey avenue on the north the work was to be completed by July, 1897, and in the remaining territory it should be done by July 1, 1899. This unreasonable ordinance has never been enforced, and the limit of time has expired within which the greater part of the work was to have been completed. It will be noted that the second policy of the city was to force the railroads to elevate all tracks regardless of the wide difference of conditions existing on the several roads. All the actual work of elevating tracks which so far has been done has come about through the voluntary action of the railroads and the work has been done under special ordinances based upon the plans prepared by the railroad engineers, who in turn have acted in conjunction with the special engineers of the city having these matters in charge.

The track elevation work so far completed has been covered by detail descriptions from time to time in the *Railroad Gazette*, so that in the present summary reference is only briefly made to what has already been published. However, considerable information is now given which was not before available, and this has been taken from the report recently made to the Department of Public Works, Chicago, by Mr. John O'Neil, who has charge of all track elevation matters for the city.

The following table gives in condensed form the main features of the work so far covered by ordinances, but it is a difficult matter to put in such form any but the most general facts, as each ordinance provides for special features which cannot be tabulated within the limits of our space.

The first tracks elevated were those of the Illinois Central. From the Randolph street station to Forty-seventh street the road is built along the margin of Lake Michigan; the right of way is separated from the adjoining property by a high stone wall, and there are no street or railroad crossings in this distance. The elevation of the tracks commences at a point near Forty-seventh street; the first subway is at Fifty-first street and the last at Sixty seventh street; the foot of the incline on the south end is at Seventy-second street, so for about eight miles the eight tracks of this road are fully protected and free from grade crossings.

The next roads to elevate their tracks were the Chicago, Rock Island & Pacific and Lake Shore & Michigan Southern, acting jointly. At present this elevation begins just south of the Sixteenth street crossing and extends beyond Fifty-seventh street, meeting the old grade under the viaduct at Sixty-first street. The number of tracks raised varies throughout from four to six, and the heaviest work was in elevating the Lake Shore yards near Fortieth street and the Rock Island yards at Fifty-first street; these yards have respectively 15 and 12 parallel tracks.

The tracks of the Union Stock Yards and Transit Company at Fortieth street were depressed sufficiently to permit of the overhead crossing of the Lake Shore and Rock Island tracks. Beyond Sixty-first street the tracks of the Chicago, Rock Island & Pacific and Lake Shore & Michigan Southern diverge, while the Pittsburgh, Fort Wayne & Chicago crosses the Rock Island at Sixty-third street and runs parallel to the Lake Shore; the raising of the tracks near Sixty-third street will therefore have to be done by the three roads working together. With this end in view, the Pittsburgh, Fort Wayne & Chicago during the past summer put in the foundations for several subways and constructed retaining walls north of Fifty-fifth street, so that these tracks can be raised rapidly early in 1898. The largest work remaining for the Lake Shore & Michigan Southern is the elevation of the extensive yard between State street and South Park avenue, and it is estimated that this alone will cost about $1,000,000.

The first track elevation on the Chicago & Northwestern was that done on the Galena Division; here five parallel tracks were elevated. On the Milwaukee Division the three parallel tracks have been raised, the first subway being at Diversey avenue and the last at Balmoral avenue; under the ordinance passed Dec. 2, 1897, this elevation will be continued south to Chicago avenue. The tracks in Rockwell street have also been elevated, in-

volving the Chicago & Northwestern and the Pittsburgh, Cincinnati, Chicago & St. Louis; the number of parallel tracks at the various subways was either five or six, excepting at Twelfth street, where 12 tracks were raised. This work made necessary the elevation of the Lake Street and Metropolitan West Side Elevated structures and the tracks of the Chicago & Northern Pacific, where these roads cross Rockwell street.

The ordinances of March 30, 1896, and Dec. 2, 1897, provide for the elevation of the three parallel tracks of the Wisconsin Division of the Chicago & Northwestern, from North Forty-fourth avenue, near the entrance of the Mayfair yard, to Clybourn Junction where the proposed elevation at the south end of the Milwaukee Division will be joined; the crossing of the Council Bluffs Division of the Chicago, Milwaukee & St. Paul near North avenue, and the junction of the "Mayfair Cut-off" of the Chicago & Northwestern, near Irving Park Boulevard, will be elevated to meet the proposed new grade. This work is to be commenced April 1, 1898. The bridges are now being built by the Lassig Bridge & Iron Works, Chicago, and the crushed stone for the concrete is being unloaded where the subways are to be built. Contracts have been made with the Knickerbocker Ice Company for furnishing the sand filling and with the O'Loughlin Stone Company, Ives, Wis., for the cut stone. It is estimated that the cost of the subways will be approximately $700,000, and 483,000 cu. yds. of filling sand in place will cost $300,000, making a total estimated cost of about $1,000,000 for the work on the Wisconsin Division.

Mr. L. H. Evans, Engineer of Track Elevation for the Chicago & Northwestern, states that that road has now elevated, or has plans covered by ordinances for raising all the Northwestern tracks in Chicago, where that road can act independently of other large interests, and that the work which is now covered by ordinances will be promptly executed. The work so far completed is about one-half of the whole work necessary to comply with all the Northwestern ordinances.

It is the intention to commence work at the Sixteenth street crossing early in the spring of 1898, and it is expected that this work can all be completed within three months. The above table shows which tracks will be elevated and which depressed. The South Side Elevated Railroad has already raised its structure to the height prescribed in the ordinance, and a more detailed account of this work will be given later.

So far the Chicago, Milwaukee & St. Paul has done nothing toward elevating its tracks, and has failed to file its acceptance of the ordinance passed Dec. 2, 1897, within the time limit specified. The original ordinance was agreed to by the road, but later certain unreasonable amendments were added which would greatly increase the cost of the work to the railroad. This ordinance provided for the elevation of the Chicago Division of the Chicago, Milwaukee & St. Paul between Central Park Boulevard and Irving Park Boulevard, a distance of about 6 miles; provision is made for elevating the Council Bluffs Division for a distance of about 0.6 mile at Pacific Junction and also the crossing of the "Mayfair Cut-off" of the Chicago & Northwestern.

Many plans are under way for track elevation on other Chicago roads, and now that the city authorities have come down to a reasonable working basis, it would appear that much work of this nature may be done at Chicago in the near future. An idea can be gained of the amount of labor necessary to make these changes from the fact that 15,000 men were employed directly and indirectly in railroad track elevation during the past summer.

THE PRESENT STATUS OF TRACK ELEVATION IN CHICAGO.

Name of railroad.	Date of ordinance.	Limits of track elevation. From	Limits of track elevation. To	Distance between limits. Miles.	Number of grade crossings eliminated.	Estimated cost.	Decription published in *Railroad Gazette.*	Remarks.
Illinois Central	May 23, 1892...	Forty-seventh St...	Seventy-first St ..	3.0	13	$2,000,000	March 15, 1895.	Completed May, 1893.
Chicago, Rock Island & Pacific and Lake Shore & Michigan Southern.....	July 9, 1894....	Sixteenth St.....	Sixty-ninth St.... / Sixty-seventh St..	8.5	41	3,000,000	Oct. 19. 1894, and Nov. 6, 1893.....	From Sixteenth St. to Fifty-seventh St. Completed at end of 1897.
Chicago & Northwestern (Galena Div).....	Feb. 18, 1895...	Sacramento Ave..	W. Forty-third St..	2.5	6	400,000	March 1, 1895, and July 26, 1895.....	Completed November, 1895.
" " (Milwaukee Div.)	March 30, 1896	Wrightwood Ave.	Rosehill.....	4.5	20	900 000	Aug. 7, 1896.....	Completed June, 1897.
" " (Wisconsin Div.)		Armitage Ave....	N. Forty-fourth Av.	4.5	48	1,000,000	....	Work will be commenced in March, 1898.
Pittsburgh, Ft. Wayne & Chicago.....	July 27, 1896...	Fifty-fifth St.....	Sixty-seventh St...	2.0	13	750,000	... .	Unfinished; part of the retaining walls and bridge foundations in place.
*Pittsburgh, Fort Wayne & Chicago and Lake Shore & Michigan Southern.....	Jan. 18, 1897...	State St..... / Sixty-first St.....	St. Lawrence Ave.. / St. Lawrence Ave..	1.0 / 2.0	2 / 2	150,000 / 1,000,000	..... /	Not commenced. / Includes elevation L. S. & M. S. yard—State St. to South Park Ave.
Chicago & Northwestern and Pittsburgh, Cincinnati, Chicago & St. Louis (Rockwell St. Line).....	Jan. 18, 1897...	Kinzie St.....	Ogden Ave.....	2.0	19	1,000,000	Aug. 13, 1897.....	Completed Oct. 1, 1897.
**St. Charles Air Line (Sixteenth St. crossing).....	May 17, 1897...	....	....	3.0	8	2,000,000	.....	Alley "L" tracks raised. Other work will be commenced early in 1898.
Chicago & Northw't'rn (Milwaukee Div.)	Dec. 2, 1897....	Chicago Ave..... / Clybourn Junc..	Diversey Ave..... / Wood St.....	3.0	27	1,200,000	.....	Work not commenced.
‡Chicago, Milwaukee & St. Paul (Chicago Div.).....	Dec. 2, 1897...	Central Park Boul.	Irving Park Boul..	6.0	30	.....	.....	Work not commenced.

*Supplemental ordinance.
**The roads whose tracks will be elevated are: Lake Shore & Michigan Southern; Chicago, Rock Island & Pacific; Chicago, Madison & Northern; Chicago & Alton; St. Charles Air Line, and South Side Elevated Railroad. The depressed tracks are: Chicago & Western Indiana and Atchison, Topeka & Santa Fe.
†Includes the elevation of the crossing of the Council Bluffs Division of the Chicago, Milwaukee & St. Paul, near North Ave., and the "Mayfair Cut-off" of the Chicago & Northwestern, where it joins the main line near Irving Park Boulevard.
‡Includes the elevation of the crossing of the C., M. & St. P. branch line at Pacific Junction and the crossing of the C. & N. W. "Mayfair Cut-off." Ordinance not accepted by the railroad officials.

A society of railroad men recently gave a dinner to 43 trainmen employed on the Austrian State Railroads who had served from 25 to 39 years. At this dinner the Minister of Railroads made a speech.

The Vigilant Feed-Water Regulator.

Successful devices, intended to render more safe the management of steam generators, especially those in service in vicinities where many people might be more or less seriously hurt in the event of an explosion, should command the attention of those responsible for the safe condition of such boilers.

The Vigilant Feed-Water Regulator shown in the accompanying figure has for about two years proved conclusively, in many of the large mills of Pittsburgh, its ability to automatically regulate the supply of water to a boiler, so that the variation between the highest and lowest water levels in same would not vary at any time more than ¾ in. from a given point.

The result of such regularity in the water-level is economy in fuel consumption and generation of steam of uniform dryness, thus reducing to a minimum the possibilities of damage to cylinders caused by water being carried over with the steam, and at the same time injury to crown sheets, etc., by low water.

The device is located on the top of a water column, which is attached to any convenient part of the boiler, and with connections near the top, and at the bottom, with the steam and water spaces, and at such an elevation that a zero mark on the column coincides with the desired mean water level in the boiler.

The Vigilant Feed Water Regulator.

At the head of the column, and capable of motion in a vertical plane, is an oscillating hollow lever, terminating at one end in a hollow copper ball *F*, and at the other in a counterbalance weight.

On one side of the column is a small condenser, for furnishing water under boiler pressure, for operating the regulating valve, which is of a diaphragm type, and used for controlling the water supply to boiler.

On the lever, and on each side of the fulcrum, are collars, which on account of the oscillating motion of the lever, alternately open and close two valves, allowing the condensed water to enter and close, or to be discharged from and open the regulating valve.

When the water level in the boiler reaches a certain height, it seals a connection with the copper ball, which was previously filled with steam, the result being a condensation of steam in the ball, and its immediate replacement by water, which by gravity depresses that end of the lever, closing the release valve, and at the same time opens the pressure valve, allowing the condensed water to depress and close the regulating valve, thus stopping further supply of water to the boiler.

When the water in the boiler reaches such a level as to unseal the connection with the copper ball, the operations previously described are reversed, and steam takes the place of water in the ball, that end of the lever rising to its original position, due to the weight of the counterbalance. The pressure valve is closed, and the release valve opened, causing the regulating valve to again open and start the water supply.

A whistle, operated by a thermostat, gives notice of the lowering of the water level to a point corresponding to the lower gage-cock, in the event of the supply of water being shut off at the main, or beyond the control of an ordinary boiler tender.

With boilers using waste heat from furnaces, it is a very difficult matter to properly take care of the water supply, and for such boilers this device is specially adapted.

Among the users in Pittsburgh of the regulator, the Carnegie Steel Co., Ltd., have 16 now in operation and have just ordered 26 additional ones; Pittsburgh Bureau of Water and Distribution have 23; Brown & Co., Incor., Wayne Iron Works, 12; Howe, Brown & Co., Ltd., 7. Some of these, as above stated, have been in constant service nearly two years. The regulators are made at Pittsburgh by the Chaplin-Fulton Manufacturing Company.

The "Ups and Downs" of a Lift Bridge.

Within the past two months the lift bridge over the Erie canal at State street, Syracuse, has attracted some attention, inasmuch as it recently imperiled life by suddenly rising to the open position, and later by falling when half raised. The bridge has a clear span of 70 ft. and a lift of about 12 ft. The entire structure, which is of steel, was completed not more than four years ago. The platform is connected to the counterweights, one on each side, by eight 1¼-in. bolts and ⅞-in. wire cables with hemp core, on each side. The counterweights are iron troughs about 70 ft. long, open at the top and loaded with pig iron to such an extent as give a considerable excess over the weight of platform, which excess is the only force used to lift the bridge. The wire cables pass twice around sheaves 3 ft. in diameter, fixed to an overhead shaft on each side of the bridge, the shafts being geared together at each end by cross shafts and miter gearing. On one of these cross shafts is fixed a drum on which runs the chain connected to the end of piston rod of the hydraulic cylinder for operating. This cylinder is so connected through the chain and cross shaft that its function is to raise the counterweight or allow it to fall, the counterweight being the direct operating force of the bridge. The cause of the first accident, the "falling up" of the bridge, was the failure of the cylinder and chain to hold up the counterweight, due to breakage of some part of the connections. The falling down of the bridge later was caused by the rupture of all the supporting cables on one side, probably beginning at one of the end ones.

There were several probable co-operating causes for the failure of the cables:

First, the previous accident had probably strained the cables beyond the elastic limit, at least in some of the strands; second, the cables were wrapped twice around sheaves of too small diameter: third, the only take-up for each cable was on the side of the bridge, resulting in the probably unequal straining of the cables on the counterweight side. That there was such unequal straining was evident from an examination of the comparative tension of the uninjured cables on the other side, some being appreciably slack.

In a bridge of this design, as the bridge is down most

of the time, it would be better to have the counterweight somewhat less than the weight of roadway, enough to make lowering sure; and the force applied should be used to raise the bridge, instead, as in this case, of raising the counterweight to close the bridge after the counterweight has raised it by its excess of weight, such excess causing an additional strain in the cables at all times, as well as producing the danger of the bridge rising without warning in case of injury to the operating mechanism. The design is therefore evidently wrong.

An examination of the ruptured cables disclosed the fact that not more than half the wires had been intact, this condition probably being due to the previous accident, in conjunction with the frequent setting to small curvature and straightening again, the breaks in most cases being near the tangent point when down.

Schenectady Locomotives for Japan.

The specifications which follow and the engraving from a photograph describe a lot of 10 locomotives just shipped to Japan for the Imperial Government Railways by the Schenectady Locomotive Works.

EIGHT-WHEEL LOCOMOTIVE FOR THE IMPERIAL GOVERNMENT RAILWAYS OF JAPAN.

General Dimensions.

Gage	3 ft. 6 in.
Fuel	Japanese bituminous coal
Weight in working order	78,600 lbs.
" on drivers	52,350 lbs.
Wheel base, driving	7 ft.

Cylinders.

Diameter of cylinders	16 in.
Stroke of piston	24 in.
Horizontal thickness of piston	5¼ in.
Diameter of piston rod	2½ in.
Kind " " packing	Cast-iron rings
" " " rod packing	Jerome metallic
Size " steam ports	14 in. × 1¼ in.
" " exhaust "	14 in. × 2½ in.
" " bridges "	1 in.

Valves.

Kind of slide valves	American balanced
Greatest travel of slide valves	5¼ in.
Outside lap " " "	⅞ in.
Inside " " "	Line and line
Lead of valves in full gear	Line and line
Kind of valve stem packing	Jerome metallic

Wheels, etc.

Diameter of driving wheels outside of tire	54 in.
Material " " " centers	Cast iron
Tire held by	Shrinkage
Driving box material	Steeled cast-iron
Diameter and length of driving journals	7 in. diam. × 8 in.
" " " " main crank pin journals (Cambria Steel Coffin process)	4½ in. diam. × 4¼ in.
Diameter and length of side rod crank pin journals (Cambria Steel Coffin process)	3¾ in. diam. × 3½ in.
Engine truck, kind	Four-wheel swing bolster
" " journal	4½ in. diam. × 8 in.
Diameter of engine truck wheels	26 in.
Kind " " " "	National, steel-tired spoke center, 3-in. tire

Boiler.

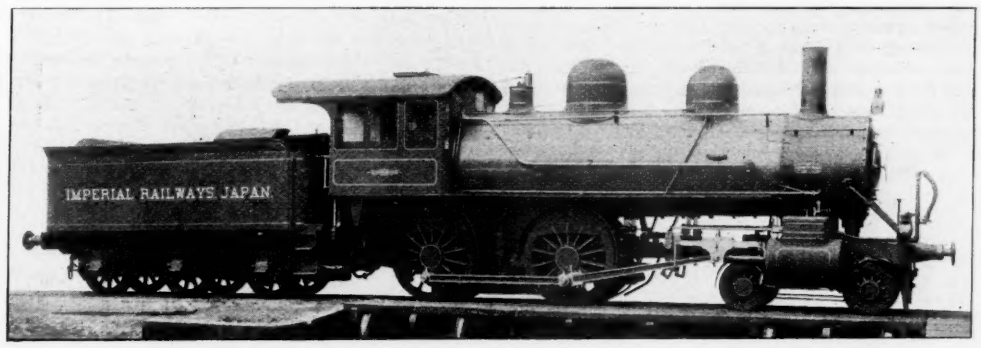
Style	Extended wagon top
Outside diameter of first ring	52 in.
Working pressure	160 lbs.
Material of barrel and outside of firebox	Carnegie steel
Thickness of plates in barrel and outside of firebox	9/16 in., 5/8 in., 11/16 in. and ½ in.
Horizontal seams	Butt joint, sextuple riveted with welt strip inside and outside
Circumferential seams	Double riveted
Firebox, length	78 in.
" width	29⅝ in.
" depth	Front, 55 in.; back, 48 in.
" material	Copper
" plates, thickness	Sides, ½ in.; back, ½ in.; crown, ½ in.; tube sheet, ⅝ in. to ½ in. below tubes.
" water space	Front, 4 in.; sides, 2½ in.; back, 3 in. to 4 in. at crown.
" crown staying	Radial stays, 1 in. diam.
" stay bolts	1⅛ in. soft rolled copper
Tubes, material	Solid drawn brass
" number of	196
" diam	1¾ in.
" length over tube sheets	11 ft.
Heating surface, tubes	980.17 sq ft.
" " firebox	93.5 sq. ft.
" " total	1073.67 sq. ft.
Grate "	16.04 sq. ft.
" style	Rocking, with drop plate
Ash pan "	Sectional, dampers, front only
Exhaust pipes	Single high
" nozzles	3¾ in., 4 in., 4¼ in. diam.
Smokestack, inside diameter	14 in.
" " top above rail	12 ft. 1 in.

Boiler supplied by two Sellers injectors, Class "N" improved of 1887, No. 8½.

Tender.

Weight, empty	25,750 lbs.
Wheels, number of	6
" diam	36 in.
Journals, " and length	4½ in. diam. × 8 in.
Wheel base	10 ft. 2 in.
Tender frame	Steel plate and channels
Water capacity	2,400 U. S. gallons
Coal "	3 tons.
Total wheel base of engine and tender	40 ft.
" length, " " "	48 ft. 10 in.

Engine provided with two Coales 2½-in. safety valves, encased pop, one with relief; Detroit (1 quart) double sight feed lubricator, one "Furness" on each steam chest; Smith's Aut. Vacuum Brake on all drivers and on tender; spring buffers on front of engine and rear of tender, also between engine and tender; No. 3 Crosby 5-in. brass bell chime whistle; Ashcroft steam gage; 3 headlights, with 8-in. bulls-eye lens.



Schenectady Locomotive for Japan.

The Kudlicz Grate for Burning Fine Coal.*

The furnace illustrated was invented by M. Kudlicz, of Prague, and introduced in France about three years ago by M. Donders, of Nancy, and is adapted for burning fuels of little value, such as coke dust, coal dust, coal cinders, etc. With the Kudlicz furnace is used a forced draft, under low pressure.

The grate, as shown by Fig. 1, consists of cast-iron plates, in which are formed conical openings 0.12 to 0.16 in. in diameter at the top and 0.8 in. in diameter at the bottom. There are about 120 holes per square foot of grate surface.

The plates have various forms and dimensions, according to the purpose for which they are used, but Fig. 2 shows one of the most common arrangements. The grate is formed of transverse plates about 8.7 in. wide, supported by a frame. Underneath these plates is an air-tight chamber of sheet iron or cast iron, connected with the tuyere box, which in turn is situated directly in front of the furnace. A movable inclined lid on the front of this box carries the tuyere for injecting steam, the latter being supplied through a pipe fitted with a regulating cock for varying the quantity of steam injected. The air is drawn in from the outside, either through an underground flue or through openings in front of the tuyere box, and it is then carried under pressure into the chamber beneath the grate by means of the steam jet. From this chamber the mixture passes through the conical openings in the grate plates. The mixture of air and steam thus injected into the layer of fuel produces a very active combustion; the steam, in traversing the bed of ignited fuel, is immediately decomposed into oxygen, which renders the combustion more intense, and hydrogen, whose calorific effect is added to that of the incandescent fuel. The movable cover of the tuyere box allows the injector to be inspected, and gives access to the air chamber under the grate, so that the few ashes which fall into it may be raked out. The current of air and vapor continually cools the plates and prevents the formation of iron scale.

The fire is regulated by the cock in the steam pipe; more or less air is drawn in and the pressure in the air chamber increased or diminished. It is well, however, never to remove this pressure entirely by completely cutting off the supply of steam while the furnace is in operation; and even when the fire is being drawn it is advisable to keep up a feeble current of air and steam, so as to cool the plates and prevent the ashes from falling into the air chamber in too great quantities.

In this furnace, as in all others with forced draft, the lighter portions of the ash are carried beyond the grate by the current of air. Most of this ash dust falls into a pit behind the furnace, so that while the flues require slightly more frequent cleaning, yet this additional expense is so small as to be neglected when compared with the economy obtained from using a cheap grade of fuel.

The Foundry & Furnace Company, of de Pont à Mousson, which has installed several Kudlicz grates, for burning coke dust exclusively, has determined by comparative experiments that 1 lb. of such fuel will evaporate from 7 to 7.4 lbs. of water, which is very nearly equal to the performance of an ordinary grate with good coal costing much more. M. Rogé, manager of the company, says that while the amount of water evaporated is but little different from ordinary practice, the economy is none the less great, for while the coal used heretofore has cost about $3.25 a ton, the coke dust costs almost nothing.

In the report of a test made in August, 1895, at Amiens, of a semi-tubular boiler with 1,044 sq. ft. of heating surface, by M. Schmidt, Chief Engineer of the "Association des Propriétaires d'Appareils à Vapeur," we find the following conclusions: There was realized 67 5 per cent. of the theoretical and 70 per cent. of the available calorific power of the mixture of fuel used. The mixture consisted of about seven-eighths of fine coal dust and one-eighth of coarse fuel. During these experiments the average pressure in the air chamber was only 0.43 to 0.47 in. of water and was never greater than 1.2 in. The consumption of coal dust per foot of heating surface per hour was 0.27 lbs.

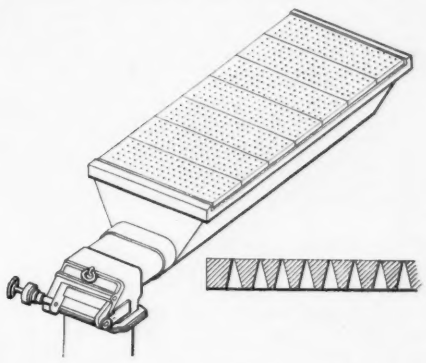


Fig. 1 —Grate with Plain Surface—Kudlicz Furnace.

A Kudlicz furnace using coke dust has been in operation at the works of the Paris Gas Co. at La Villette for nearly two years. Fig. 2 shows a Kudlicz grate at the Sotteville lés-Rouen shops of the Western Railroad Company. This furnace burns cinders from the locomotives which were formerly considered waste material. The Eastern Railroad Company at its Epernay shops makes a similar use of locomotive cinders on Kudlicz grates. MM. Solvay & Co. also has Kudlicz furnaces in the works at Salins-de-Giraud.

The Kudlicz grate can be used with good results in high temperature metallurgical furnaces, and also in gas works, which are thus able to burn their coke waste and coke dust with or without mixing with coal dust.

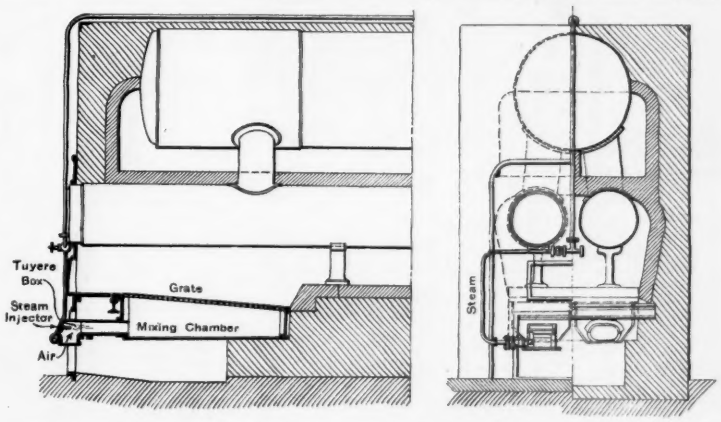


Fig. 2 —Arrangement of Kudlicz Furnace for Burning Locomotive Cinders.

*Abstract of a paper in the *Revue Industrielle.*

British Iron in 1897.

We attach much importance to a new factor which has made itself very manifest during the past 12 months —the competition of American iron both at home and abroad. Twelve months ago this competition was felt, but only to a limited extent, and it was generally assumed that it was due to the exceptional depression which was experienced in the United States, and that so soon as this had passed away, prices in America would rise to such a point as would make it unprofitable to continue shipments. The total exports from the United States, which in 1896 were about 100 000 tons, are estimated to reach over 500,000 tons in 1897. The principal items are pig-iron and steel rails. The former comes mainly from the state of Alabama, and is shipped from the Southern ports in cotton ships. Being able to carry iron in addition to a full cargo of cotton, it is taken at a comparatively low rate of freight, and in this way it can be laid down at a price to compete with pig-iron of British production.

It is necessary now to explain how the American manufacturer has so suddenly come to the front and manifested so controlling an influence over the iron and steel trade of the world. The changes which have taken place in the cost of production in the United States during the last four years are simply marvelous, and could scarcely be credited were it not vouched for on the very best authority. Much is no doubt due to the free use of the wealth accumulated during the period of high prices, and which has been spent in the extension and erection of new works, securing every possible improvement in labor-saving machinery, coupled with economy in every department: and all this has been assisted by the cheap cost of transport over long distances by rail. It will surprise many to learn that coal is much cheaper in America than in England.

The carriage to the shipping ports of Pensacola and Mobile (a distance of about 270 miles) is only 10s. per ton, or about one-half the rates which would be charged in this country. Although pig-iron is exceptionally cheap in the Southern states, still, as similar conditions exist in the Pittsburgh districts, we can understand how the Carnegie Company are able to compete with the makers of English rails at a time when, by a combination, the price has advanced from £3 15s. to £4 10s. per ton. Although considerable quantities of steel bars and billets, wire and other kinds of manufactured steel have been imported, it would appear as if

pig-iron and steel rails were the departments in which the American makers were likely to have the greatest amount of success.

In face of all the foregoing facts it is all the more remarkable that the English trade was so healthy and satisfactory during 1897. The production of pig-iron we estimate between 8,900,000 and 9,000 000 tons, which is the largest on record, and is about 250,000 tons in excess of 1896. Visible stocks were reduced about 400,000 tons, and are probably now about 800,000 tons, which is the smallest stock we have had for many years. Still, with all these satisfactory features, prices of pig-iron were not maintained. Scotch warrants are the most reliable standard of values, and these were 48s. 9d. in January, 43s. 2d. in April, 46s. 2d. in June and 45s. 4d. at the close of the year. Manufactured iron and steel became somewhat cheaper during the year. Steel rails, although still under the control of a combination, were allowed to recede about 5s. per ton, under the force of foreign competition.—*The Economist.*

New Locomotives for the Northern Pacific.

We have mentioned before the recent order of the Northern Pacific for new engines which was placed with the Schenectady Locomotive Works. This order includes eight 10-wheel single-expansion passenger locomotives, eight 10-wheel compound passenger, and eight 10-wheel compound freight engines. We are indebted to Mr. E. M. Herr, Superintendent of Motive Power of the Northern Pacific, for the copies of the specifications from which the following particulars are taken. In addition to the details given in the table, the specifications call for Westinghouse automatic air-brakes on the tenders; Westinghouse air signals; American driver brakes, operated by air, on all drivers; Allen-American balanced valves: Ashton safety valves; Jerome metallic packing, made by the C. C. Jerome Co.; Standard truck wheel centers, spoke pattern and Standard tender wheel centers, plate pattern; A. French Spring Co.'s springs; Gollmar bell ringers: Kewanee brakebeams, and McIntosh blow-off cocks. The passenger engines will be equipped also with steam heating apparatus furnished by the Consolidated Car Heating Co. and with Mason reducing valves.

Iron axles for engines and tenders, nickel steel crank pins, magnesia sectional boiler lagging, M. C. B. couplers on tenders and pneumatic sanding devices will also be used.

NORTHERN PACIFIC ENGINES—TABLE OF GENERAL DIMENSIONS.

	Single expansion passenger.	Compound passenger.	Compound freight.
Type	10 wheel class "P."	10 wheel class "P."	10-wheel class "S."
Number ordered	8	8	8
Gage ft. in.	4 8½	4 8½	4 8½
Simple or compound	Simple	Compound	Compound
Weight on drivers lbs.	112,000	112,000	126,000
" " tr'k wheels lbs.	38,600	43,500	48,500
" total lbs.	150,600	155,500	174,500
" tender loaded lbs.	94,000	94 000	92,030
" " empty lbs.	39,600	39 600	37,800
Wheel base, total, of engine ft. in.	25 10	25 10	26 03
Wheel base, driving ft. in.	14 10	14 10	14 10
" " total (engine and tender) ft. in.	52 2	52 2	52 9½
Length over all, eng. ft. in.	59 1	59 1	60 0
Width " " ft. in.	10 6	10 6	10 6
Height of stack ft. in.	14 9¾	14 9¾	14 10½
Heat. surface firebox sq. ft.	168.03	168.03	208
" " water tubes, sq. ft.	28.95	28.95	32 1
" " tubes sq. ft.	2288.02	2288.02	2655.4
" " total sq. ft.	2485.00	2485.00	2895 5
Wheels and Journals.			
Drivers, number	6	6	6
" diameter in.	69	69	63
" material of centers	Cast steel	Cast steel	Cast steel
Truck wheels, diam. in.	33	33	30
Journals, driving axle, size main in.	9 × 11	9 × 11	9 × 11
Journals, driving axle, size front and back in.	8½ × 11	8½ × 11	8½ × 11
Journals, trck axle, size, in.	6 × 11	6 × 11	6 × 11
Cylinders.			
Cylinders, diameter in.	20	22 and 34	22 and 31
Piston, stroke in.	26	26	28
Kind of piston rod packing	Metallic	Metallic	Metallic
Boiler.			
Boiler, type of	Extended wagon top	Extended wagon top	Extended wagon top.
" thickness of material in barrel in.	⅝, 11/16, ½, 7/16	⅝, 11/16, ½, 7/16	11/16, ¾, ⅝, 9/16, ½
Boiler, diameter of barrel smokebox end in.	62	62	70
Thickness of tube sh'ts in.	½	½	½
" crown sheet in.	⅜	⅜	⅜
" side sheet in.	5/16	5/16	5/16
" back " in.	5/16	5/16	5/16
Dome, diameter in.	32	32	32
Firebox.			
Firebox, length inside ft. in.	9 3/16	9 3/16	10 3/16
" width ft. in.	3 5	3 5	3 5
" depth front in.	76	76	84
" " back in.	64	64	71½
" thickness of sht's.	No. 12 W.G.	No. 12 W.G.	No. 12 W.G.
Tubes.			
Tubes, number	314	314	376
" outside diam. in.	2	2	2
" length over sheets, ft. in.	14 0	14 0	13 10
Tender.			
Type—Six-wheel or with swivel trucks	Swivel trucks	Swivel trucks	Swivel trucks
Tank cap. for water gals.	4,350	4,350	4,350
Coal capacity tons.	9	9	9
Diam. of truck wheels in.	33	33	33
Diam. and length of axle journals in.	4½ × 8	4½ × 8	4½ × 8

The Compressed Air Situation.

The most reasonable and probably the most important thing that has been done for a good many months toward the development of compressed air as a motive power was accomplished last week in the consolidation of the various companies operating in New York. Those companies are the American Air Power Co., of New Jersey, the General Compressed Air Co., of New Jersey, and the Compressed Air Power Co., of New York. They have been consolidated into the American Air Power Co., of New York, with $7,000,000 capital The terms of the consolidation provide, we believe, that the stock of the new concern shall be exchanged for the stock of the old companies, share for share, except in the case of the Compressed Air Power Co., which receives two shares of the new stock for one share of old, this company having considerably more visible assets in the way of machinery than the other companies. The two companies first named are those which have been engaged in developing the Hardie motor. The third company, namely, the Compressed Air Power Co., of New York, is the one which has been working up the Hoadley-Knight motor. The organization of the new company is not yet completed, and therefore we cannot give the names of its officers.

We judge that this consolidation will result now in a thorough and vigorous and convincing trial, in actual work, of compressed air motors, as applied to city transportation, and that is why we have said that this consolidation is the most reasonable and important thing that has been done recently. The only way to settle this question is to put the motors into service under the conditions which they will have to meet in providing for the hourly needs of a considerable passenger movement, and so ascertain precisely what the advantages and what the weaknesses of this class of motor may be. From what we can learn we suppose that such an experiment will be carried out in New York City very soon. It is the purpose now of a number of influential men, interested in this matter, to put on compressed-air motor cars for regular passenger service on the Twenty-eighth street and Twenty-ninth street Cross town lines, and let them be responsible for handling the business, without any help or complication from other classes of motive power. Inasmuch as the gentlemen who control the Metropolitan Street Railway Co. are also considerably interested in the compressed-air company, it is reasonable to suppose that such a trial will be put under way shortly and carried out vigorously.

The St. Paul Wheel Record.

The record of cast-iron wheels on the Chicago, Milwaukee & St. Paul is continued from previous years in the *American Engineer, Car Builder, Etc.*, by figures for 1896 and 1897, supplied by Mr. Barr. We condense the tables below:

Statement Showing Service of Freight Car Wheels.

Year.	Average mileage.	Average life of wheels. Year.	Month.	Days.
1885	76,968	6	11	15
1886	97,080	8	9	15
1887	81,152	7	0	1
1888	85,544	7	5	17
1889	77,124	7	0	1
1890	133,468	12	0	21
1891	190,776	16	0	12
1892	154,528	12	1	18
1893	144 240	12	10	21
1894	159 784	19	1	4
1895	162,776	15	6	26
1896*	129,104	11	3	22
1897*	159,784	15	0	15

* On fiscal year basis.

Passenger Service.

Year.	All scrapped except for sliding. No. of wheels.	Average mileage.	Scrapped for sliding. No. of wheels.	Average mileage.	Total scrapped. No of wheels.	Average mileage.
1885	1,676	45,731	1 279	20,654	2,955	34,895
1886	1.058	70 468	607	31,801	1,665	56,359
1887	889	85,653	673	46.759	1,562	68 554
1888	836	100,455	986	49 061	1.822	72,645
1889	941	106.916	941	54.936	1.882	80,788
1890	1,081	101,919	606	48,722	1,687	82,770
1891	1,828	1 3,252	781	48,260	2,609	86,887
*1892	2,194	105,852	1,022	46,821	3.216	86,479
*1893	2,219	105.218	1,159	39.886	3,378	83,156
*1894	2,387	109,999	1,063	42.610	3,450	89 235
*1895	2,194	110,127	909	40.771	3,103	93 219
*1896	2,630	111,215	726	38,747	3,356	95,568
*1897	3,139	105,250	1,251	32,604	4,390	84,143

* Fiscal year basis.

The average mileage is obtained by dividing the total car mileage during the year by the number of wheels taken out. This does not give accurate figures for any particular year, but it does give a correct method of comparison when a number of years are covered, and the statement shows the average mileage of all wheels taken out for all causes.

The average mileage for the past eight years is much larger than before that period, and there is a variation between 133,000 to 190,000 miles in the eight years. It has already been pointed out that between the years 1889 and 1890 there was a sudden jump in the figures, which is probably due to the introduction of the contracting chill which has been used for a large proportion of wheels cast since that time.

Illinois Street Railway Association.

In response to a circular letter issued Dec. 18 last, a meeting of the representatives of sixteen street railroads in Illinois was held at the Great Northern Hotel, Chicago, on Jan. 5, for the purpose of organizing a state association of street railroad officers similar to the present associations in several other states. Letters were received from ten roads, that could not send delegates, indorsing the movement. It is stated that the object of the Association is to unite the street railroad men, and that at the annual meetings papers pertaining to the installation, construction and operation of street railroads will be read and discussed. It is said, however, that the prime object of the Association is for the protection of street railroad interests from hostile state legislation.

A constitution and by-laws were adopted and the following officers were elected for the ensuing year: President, Mr. W. H. Patterson, Bloomington City Ry; Vice-President, Mr. D. B. Sherwood, Elgin & Aurora Street Ry.: Secretary and Treasurer, Mr. T. J. Minary, Springfield Consolidated Ry. The Executive Committee consists of the above-named officers together with Mr. W. L. Ferguson, Decatur City Electric Ry.; Mr. B. F. Harris, Jr., Urbana & Champaign Electric St. Ry.: Mr. W. F. Brennan, Chicago General Ry., and Mr. Walter Barker, Peoria Central Ry.

The first regular meeting will be held at the Great Northern Hotel, Chicago, on May 18 next.

The Anti-Scalping Bill.

The General Passenger Agents and other railroad men who are working for the passage of a federal law to prohibit brokerage in tickets are continuing their campaign with great vigor, and on Friday of last week hearings were held at Washington by committees of both the Senate and the House. Mr. George W. Boyd, Assistant General Passenger Agent of the Pennsylvania, made a long statement. He said that there was no more nefarious traffic in the country to-day than that of the scalping fraternity, and that 90 per cent. of the tickets lost or stolen from railroads find their way into the scalping offices, and thence into public use. The assertion that 95 per cent. of the tickets used by scalpers were furnished direct by the railroads was ridiculous. Certainly very few were secured direct from any reputable railroad. In many cases the scalpers send their representatives to the railroad offices to get tickets and sell them in their own offices under very different and wrongful conditions, advising, in some instances, that the travelers forge the names on the tickets He introduced papers in evidence, showing the way in which tickets, lost or stolen, were bought by those who take them to scalpers, and how the latter had offered to restore them to their owners for, as in one instance cited, 50 per cent. of the face value. Continuing the speaker said:

"Tickets are not merchandise. They belong to the company, and when their functions are performed they become part of the company's property and should be regarded in that respect, like a baggage check.

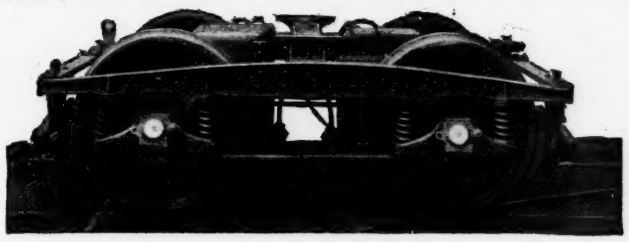
"The ticket scalpers claim that they are a benefit to the people who travel, because they sell them tickets at low rates, and that this is accomplished without inconvenience to the traveling public, but the reverse is the case. A large percentage of the people who deal with scalpers are seriously inconvenienced. They are given tickets by circuitous routes, and are subject to delays and extra expenses by having tickets not valid for passage. Scalping offices are a constant incentive to employees who handle railroad tickets to become dishonest. This view of the case is confirmed by the records of the Pennsylvania Railroad, which show that large numbers of tickets have been stolen and sold to scalpers, who in turn sold them to passengers. One of the evils of the system is the temptation to dishonesty which it puts before employees, some of whom have fallen. Only a few years ago it was discovered that tickets valued at $40,000 were stolen in a single year on the line between Washington and New York. After an investigation, several of the passenger conductors were arrested and tried, and five were convicted and imprisoned. There is not a railroad company in this country to-day that does not suffer from the fraudulent use of tickets through scalping, and the traffic is a blot on the business of the country.

'Passengers imagine that in patronizing the scalpers they are 'beating the railroad.' It often happens that they are not only swindling themselves, but are aiding to put money in the pockets of the scalper to which he has no right. The man who sells a ticket for profit, either as original purchaser or scalper, is doing an illegal act. The ticket is not a contract, only the evidence of a contract. In case the ticket purchaser elects to end his journey before he reaches the destination named in the ticket the unused portion is not his and cannot be legally disposed of save to the issuing company."

Mr. Boyd concluded by saying that the scalper's existence cannot be justified, and that the very first princi-

ples of the scalper's trade, his ability to sell the transportation lower than the issuing company, bears on its face the stamp of dishonesty.

Mr. Daniels, of the New York Central, repeated and amplified his former arguments, and presented the affidavit of Charles H. Woolley, formerly employed in the office of Mulford & Co., 89 Clark street, Chicago, telling of an elaborate scheme for selling counterfeit tickets that was worked in that office, as the affidavit says, for three months. Skeleton tickets were printed purporting to be of the issue of the Sibley, Lake Bistenau & Southern, and they were stamped as being sold at Lanesville, La. Passengers going from Chicago to California were provided with genuine tickets from Chicago to Omaha and with the fraudulent tickets from Omaha to destination. The destination was made beyond the destination of the passenger, and thus the contract was returned to the Chicago office through a California broker. The roads taking up the intermediate coupons were not cheated out of the whole fare; in fact, they were paid for the coupons taken up, and the profit of the firm issuing the tickets was derived wholly from the difference between the proportion accruing to the intermediate roads on a ticket from Louisiana and that on one from Chicago. Remittances were made in bank drafts issued in New Orleans, so that the road receiving the money would never know where the remittance originated, except from the accompanying report, which was a counterfeit of a genuine railroad report of the necessary form.



Truck of Electric Locomotive—Hoboken Shore Road.

Mr. Daniels said that he had received offers from three scalpers to appear and testify in favor of the bill if they could be promised immunity, but the offer was not accepted.

Messrs. King and Dill appeared on behalf of the Merchants' Association of New York. Mr. King supported the bill for the reasons:

1. If the governments of the several states purpose and have the authority to regulate the rates of fare, they should furnish the railroads complete protection against the scalping of tickets, provided the roads will agree to redeem the unused portions of tickets at value.
2. The railroads are not compelled to issue through tickets, but do so for the convenience of the public.
3. When the excursion ticket is sold by any railroad it is sold in good faith that the purchaser will use it both ways. The purchaser often uses it one way and goes deliberately to the scalper's office, where he sells it for what he can get, often leaving at the office envelopes addressed to himself as a means of false identification and further aiding in the perpetration of frauds. The party who buys this ticket does so knowing full well that to enjoy its use he must commit a forgery.

Mr. Dill said: Merchants generally allow their traveling men full rates and the ticket brokers' offices afford them temptation to go wrong. These places savor of darkness rather than of light, and are a trap and a temptation to young men traveling for reputable houses. Those who are opposing the bill and contending for their rights in doing so are simply contending for the right to do wrong.

The Merchants' Association sent out circulars to its 1,100 members in New York, not one of whom voted against supporting the bill, and to 30,000 firms outside, of which only 18 expressed opposition.

The Washington reporters say that the protests of the scalpers, which take the shape of petitions which have been signed in hotels all over the country, do not appear to have much influence on the minds of Congressmen. The Rochester (N. Y.) Chamber of Commerce has passed a resolution endorsing the law, and the Philadelphia Trades League sent a similar memorial to Congress.

The *Columbus* (O.) *Press* says that the ticket brokers of that city report that their business in 1897 was the worst for 20 years. Several of them have been forced out of business. At Chicago last week a man was trying to get back from a scalper $70 that he had paid for an altered ticket to the Pacific Coast, which was detected and refused when he reached St. Paul. It was part of an excursion ticket which bore the signature of a ticket agent who had been dead three years. The original date, 1893, had been plugged.

New Electric Freight Locomotive.

On Tuesday of last week the Hoboken Railroad, Warehouse & Steamship Connecting Co placed in regular service on the Hoboken Shore Road a 28½ ton electric ocomotive, built by the General Electric Co. The road is about two miles in length, running from the docks of the North German Lloyd Steamship Co. in Hoboken north along the River Walk, over a private right of way between Fourteenth and Seventeenth streets, thence to the Erie station in Weehawken, as shown by the accompanying map.

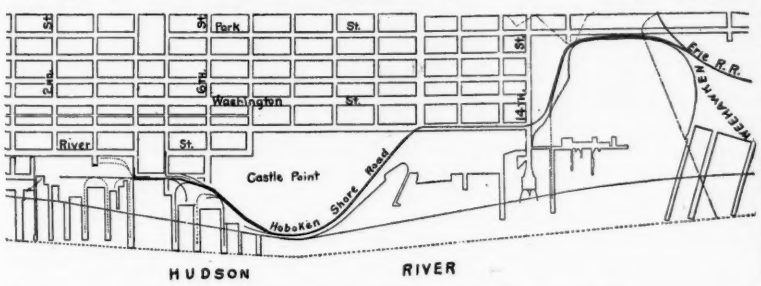
The road was opened in September last, and the switching of the cars for the past three months has been done by means of a repair car of the Hudson County Electric Railroad Co. The locomotive was built at the shops of the General Electric Company, at Schenectady, N. Y., and resembles in appearance the electric locomotive in use on the Manufacturers' Railroad, which connects with the track of the N. Y., N. H. & H. R. R. at New Haven, Conn. (illustrated in our issue of Jan. 8, 1896), and the well-known locomotives at the Belt Line tunnel of the Baltimore & Ohio at Baltimore. This recent locomotive is mounted on two four-wheel trucks (shown in the accompanying figures), each axle carrying a G. E. 2000 motor, giving the locomotive a total of 540 rated horsepower. The weight on the drivers is 57,200 lbs.; the drawbar pull is 10,000 lbs. The locomotive is driven through a single reduction gear of very low ratio. The speed is correspondingly low, and is rated at eight miles an hour when hauling a heavy load.

At each end of the locomotive is an automatic coupler and a small railed platform for the brakeman. The cab is made of iron throughout and resembles a double steam locomotive cab, with a sloping tender shield at each end. Drop windows are placed on the four sides of the cab, affording an unobstructed view in all directions to the motorman. This feature is well illustrated in the accompanying engravings. Beneath one of the shields is the compressed air tank and the equalizing air tank; beneath the other, eight resistances, two sand boxes and the engineer's tool box. At one end of the cab is placed a controller of the series parallel type known as the L 2, arranged to drive the motors either four in series or each two in series-multiple. Beside the controller is the air-brake handle and the two valves of the sanding arrangement by means of which the sand is blown under the wheels by means of compressed air.

In front of the motorman's cab is an air-brake gage and above it an ammeter reading to 500 amperes. Fastened to the roof of the cab is an "L" automatic circuit breaker set at 500 amperes. On the other side of the controller from the motorman is an "M" circuit breaker and an automatic governor switch for the air pump, placed at the other end of the cab. This is a cylinder pump driven by a 3-H. P. iron-clad bipolar slow-speed motor. The operation of this air pump is automatic. When the air in the tanks is at normal pressure the governor switch is opened. Blowing the whistle, applying the brakes or using the sander causes the pressure to fall; this closes the switch automatically and starts the motor and pump. The cab is lighted by five incandescent lamps.

The current for the road is taken from the station of the Hudson Electric Light Co.

The Hudson Shore road is one of the sub-companies of the Hudson Land & Improvement Co. organized 52 years ago, under a special charter, by the Stevens family. Mr. Edwin A. Stevens is President and Robert L. and Richard Stevens are respectively First and Second Vice-Presidents of the new road; the General Manager and Treasurer is Palmer Campbell and the Secretary W. A. Macey.



Map of Hoboken, Showing Route of Hoboken Shore Road.

The trial trip of the locomotive on Tuesday of last week was witnessed by representatives of many railroads. The locomotive was coupled to eight loaded freight cars with an aggregate dead weight of 295⅝ tons, and it handled this train with ease. It was then coupled to a number of passenger coaches, and the party made the journey over the line from Hoboken to Weehawken and return.

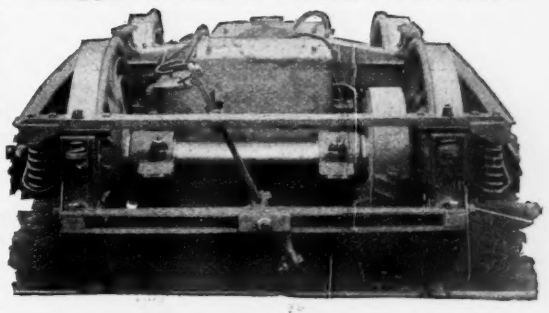
At the luncheon which followed two interesting addresses were made. Mr. F. Le Bau, General Freight Agent of the West Shore, pointed out the use and advantage of such lines as the Hoboken Shore road in facilitating the transportation of merchandise directly from the steamships. Mr. W. J. Clark, General Manager of the Railway Department of the General Electric Co., spoke as follows;

"Ten years ago, the development of three things made electric street railroads practicable and profitable. These were the under-running trolley, the carbon brush and the modern method of motor suspension. The development of three other things now renders the general application of electricity to standard railroads both possible and probable. These are the safe breaking of heavy currents, high voltage for their transmission and methods for their application to almost any load on any portion of a line. Other features are being developed that will seriously affect the result; not the least of these is the Sprague system of multiple and unit control, increasing the flexibility of the already most elastic of all transportation agents, and while the economy of electricity has already been thoroughly demonstrated in performing the same service as by steam or animal traction—at least so far as passenger service is concerned—something beyond the mere question of economy must now be considered, namely, the accomplishment by electrical methods of what would be entirely impossible with steam. The first steam railroad man within my range of acquaintance to fully grasp this idea is Mr. John Lundie, Consulting Engineer of the Illinois Central, who has set a pace on acceleration that would not have been dreamed of two years ago; and the schedule which he has mapped out for the contemplated electrical equipment of the suburban lines of his company involves a rate up to 40 miles per hour in 20 seconds. That this is practical has already been demonstrated. (See *Railroad Gazette* for Oct. 1 and 15, 1897.) The foregoing refers only to passenger service.

Interior of Cab of Electric Locomotive on the Hoboken Shore Road.

"In another direction even greater changes may be prophesied which will come from the adoption of electricity in standard railroading, viz., the lengthening of freight trains and the consequent reduction in transportation wages. The advantages of electricity will have so thoroughly demonstrated themselves in the directions suggested that instead of main steam lines with electric feeders, in 10 years it will be a question of electrically operated main lines with steam feeders through the sparsely settled districts, and a more extended system of suburban and interurban electric roads in densely populated districts also feeding the main lines.

"The electrical engineer has much to learn from the steam railroad man and must constantly rely upon him for suggestions as to the best methods of making practical applications of electricity. The American transportation man and the American electrical engineer should go on hand in hand, continuing to lead the world as they now do in all transportation problems. The American engineer has won conquests abroad as well as at home; not the least is the solution of the problem of electrical equipment for the Central London Underground Railway, the most important of this character that has as yet been accomplished. The American engineering plans were selected on account of their merit in the face of the severest competition from every European electrical manufacturing company, and no greater tribute can be paid to American engineering methods than to state that 80 per cent. of all the railroad apparatus used in Europe is designed in America, so that the American engineer stands to-day head and shoulders above those of any other country. With the encouragement of the co-operation of American railroad men, he is bound to revolutionize the entire method of transportation within a comparatively short space of time, so that American railroad methods will then, as now, be in advance of those existing anywhere else on the face of the earth."



Truck of Electric Locomotive—Hoboken Shore Road.

Proposed Legislation.

The Senate Committee on Indian affairs will report in Congress a bill limiting railroad passenger fares in the Indian territory to three cents a mile. [illegible] State Railroad Commissioners of New York have had introduced in the Legislature of that state a bill appropriating $250,000 for the abolition of grade crossings. The general law on this subject, passed a year ago, contemplated only $100,000 a year, and even that small sum is not yet available, for the reason that no appropriation has been passed. Senator Cantor has introduced in the New York Legislature an anti-trust bill. There is also a bill at Albany to compel street railroad companies to make important reductions of fares as soon as they can pay 5 per cent. on their stock, and another compelling them, in case of a blockade, to see that passengers who walk around the obstruction shall not have to pay fare the second time. In the Kentucky Legislature a bill has been introduced empowering the State Railroad Commission to make rates on all the railroads of the state.

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

In another portion of this issue will be found some extracts from recent writings by Mr. von Borries on locomotive design and performance. It will be noted that Frank's train resistance formula is given, which takes into account the effect of the different kinds of cars that go to make up the train. The well-known formula by Mr. D. K. Clark is also presented with the statement that for the purpose of estimating locomotive performance, coal consumption, and the like, Clark's formula is sufficiently accurate. Both these formulæ are based upon the assumption that the air resistance varies as the square of the speed, it being further mentioned that at high speeds the air resistance has been shown to increase directly as the speed rather than as the square. It was obviously clear to Mr. von Borries that the results obtained by the use of either of these formulæ would be too high, and especially so at the higher speeds. In view of the many discussions of this subject, which have appeared from time to time, we venture the assertion that in choosing Clark's as a working formula for train resistance, the best selection has not been made, and that other equations are known which give results nearer to those obtained in actual service. In our issue of May 21, 1897, was published an account of some train tests, made by M. Barbier, on the Northern Railroad of France, the results of which he found could be expressed by the equations:

$$R = 3.2 + 2.5\ V\ \frac{(V + 30.8)}{1000}$$ for rigid axles

and

$$R = 3.2 + 2.5\ V\ \frac{(V + 6.08)}{1000}$$ for bogie trucks

where R is the train resistance on a level, straight track given in pounds per ton of 2,000 lbs. while V is the speed in miles per hour. In the same article we made a comparison between the results given by Clark's formula, the *Engineering News* formula, a formula deduced from tests made by the Baldwin Locomotive Works, and one proposed several years ago by the late David L. Barnes. Barnes' formula for train resistance at high speeds gives slightly lower results than that of the Baldwin Locomotive Works, but the two check very closely; the *Engineering News* formula gives results too high for speeds much above 40 miles per hour, while the use of Clark's formula on several occasions in the past, where high speeds were involved, has led to absurd conclusions. Possibly the most satisfactory feature of the formula deduced from the tests of M. Barbier is that it gives results at the higher speeds almost identical with those obtained from the formula of the Baldwin Locomotive Works derived from special trials. This point was well brought out in the article above referred to, and as practically the same results were obtained by the two investigators, working independently, the agreement in the final results should have great weight in the acceptance of either formula for the calculation of train resistance.

Since the New York, New Haven & Hartford has been using locomotive cinders for fuel under the boilers at a power station, considerable interest has been taken in this method for disposing of a waste product of the locomotive. In fact locomotive cinders have been burned successfully under steam boilers for several years in France and perhaps in other countries. In this regard the description, in another portion of this issue, of a special form of furnace and grate used in France for burning cinders, coke dust and coal dust will be of interest. With this furnace a form of steam injector is used for producing the forced draft which, in principle, is the same as the arrangement of the New York, New Haven & Hartford; this road, however, makes use of the well-known "herring bone" type of grates with openings about ⅛ in. wide, while the Kudlicz grate has instead a large number of small conical holes.

The details of the boiler settings and arrangements for burning small fuel of low grade will necessarily vary to suit the conditions of each case. There seems to be some difference of opinion as to the advisability of using cinders mixed with a small percentage of coal, the New York, New Haven & Hartford using cinders alone just as they are taken from the locomotive. As locomotive cinders are largely carbon, they make a very hot fire under a forced draft. It is necessary to clean the fires often to obtain good results, but while special grates are required no extra boiler attendants are needed. It is reported that when using cinders alone in the New York, New Haven & Hartford plant, the weight of "sparks" required for the evaporation of a given weight of water is about double that of coal, but even in view of this fact, when the cost of the two fuels is compared, a considerable saving is effected by the use of cinders, as the cost of the cinders is mainly that of loading and hauling them to the boilers. Recently objections have been raised against locomotive extension fronts, which were so popular a few years ago, because of the cost of cleaning the front ends, maintaining cinder pits and loading and unloading cinders. In fact, the general tendency now seems to be to use extension fronts of very moderate size, and some front end arrangements provide that all cinders shall be carried out of the stack with the exhaust. Now that it has become generally known that cinders can be economically used as fuel in stationary boiler plants it is possible that more care will be taken to retain the cinders in the smokebox and more efficient means provided at terminals for cleaning the front ends and for loading the cinders on cars. It may be that many roads will in time find it advantageous to use cinders as fuel under the stationary boilers at their shops and large stations; at least it is an interesting subject and should have many attractions for those who are seeking for ways to effect small economies.

Traffic Review of 1897.

It is now two weeks since the close of 1897, and the asseverations of the officers of the trunk lines between Chicago and New York that the first of January would be a dividing line (between a very bad and a very good rate situation) still hold good. We are, therefore, glad to be able to look upon the past year as a closed book, and we hasten to review it as such before some one does something to disturb the present hopefulness of those who say that the rate situation is "the best in seven years."

Twelve months ago we were able to review the year 1896 in the competitive traffic field with considerable cheerfulness, and to hope that 1897 would turn out as well or better. The Joint Traffic Association had steadied rates with considerable success, the roads west of Chicago had started a somewhat similar association and the Brown decision was supposed to have scared into honest behavior such unruly traffic officers as were not held in check by the associations. But in March the Supreme Court of the United States decided that every kind of interstate railroad traffic agreement was illegal, and within three months thereafter it was admitted that the Joint Traffic Association had "lost its grip." It was not dead and is not dead now; its Board of Managers sits regularly and still does much good work, but as a regulator of rates where competition is active the Association now seems to be almost powerless. Indeed, the suit against it which was begun early in 1896 is still hanging over it, and this, with the anti-trust law, would practically nullify any rate agreement, however good, that the Managers might make.

The Supreme Court decision had the same deadening effect everywhere. The Southern States Freight Association became only a tariff bureau, and Commissioner Haines went elsewhere. The Chicago associations, though retaining their commissioners, became equally useless. Meetings have been held in that city by the dozen, and the reporters, possibly from force of habit, have reported the "results" of their doings the same as before; but it does not appear that these have amounted to anything except on paper; and if anything has been accomplished every participant is criminally liable under the anti-trust law.

There was weakness in the Joint Traffic Association before the announcement of the Supreme Court decision. The transfer of the Baltimore & Ohio from the Directors to two Receivers relieved that line from its obligations to the Association, and it was soon rumored that export grain was being carried at a third off from regular rates. The expectation that the Brown decision would put a stop to secret deviations from the published rates proved baseless. In June one of the Receivers virtually acknowledged that the B. & O. was disregarding its published tariffs, though at the same time he said that all the other trunk lines but one were just as bad. But, whoever began the demoralization, it has prevailed without hindrance to the very end of the year. An agreement has just been made to restore Eastbound grain rates, but it is yet to be seen whether it will be carried out. We cannot see how a Joint Traffic Association rate can be secretly cut by honorable men, but it is plain that such rates have been cut, in thousands of cases; and yet the roads are managed by men of honorable reputation.

While lake navigation was open the cutting of grain rates east from Chicago was a matter of secondary importance to the railroads, financially, because most of the grain was carried by the boats. It has continued, however, since navigation closed, and it appears to have been severe and widespread; but the public will not know its extent unless it shows in the monthly reports of earnings. These reports probably will not give much light, because there have been such large increases in other traffic, on which rates have not been cut. The movement of grain has been heavy to all the Atlantic ports for four or five months, and the loss from failure to secure reasonable rates is very serious. During the season of navigation the railroads from Buffalo and Erie to the seaboard have carried enormous quantities of grain, but at such extremely low rates that the addition to their net earnings from this source has been very small.

West of Chicago, since September, freight rates have been reported firm, and to the roads in that territory the grain movement was and is important, and in some degree profitable; but the very heavy Westbound freight movement that they have enjoyed for several weeks past was partly composed of Colorado shipments, which were carried at ridiculously low rates to compete with reduced rates from New York to Denver by way of steamers to Gulf ports. Since the decision of the Supreme Court in the Troy (Ala.) case, in November, calling attention to the fact (explained by Chairman Cooley ten years ago, but since forgotten) that each railroad might lawfully decide for itself when to disregard the long-and-short-haul provision of the Interstate Commerce law, the Western roads have freely made rates for long distances less than those to nearer places. They must, if complained of, justify these discriminations as having been demanded in the public interest; and the fact that they are not challenged in the courts by the Interstate Commerce Commission illustrates the inadequacy of a commission of five members, sitting in Washington, to the work of watching the course of railroad rates all over the country.

A number of events, more or less local in their character, are of interest to traffic managers as items of history. In passenger matters, the thousand-mile interchangeable ticket in the Central States territory is an interesting experiment, the result of which is yet to be seen. It embodies elements of great value for suppressing speculation in tickets, and the defection of the Michigan lines is not necessarily a fatal break; but a considerable share of the commercial travelers hate to be held down to such a strictly honest scheme, and their dislike of the new ticket is so persistent that there is still danger that their wishes may be yielded to.

New York state has passed a law suppressing ticket brokerage, but it has not yet made much disturbance among the scalpers, for the reason that a large share of their business is interstate and no one seems to have tried very hard to compel the observance of this law in interstate business. Probably such observance could not be enforced until after a favorable decision by the United States Supreme Court. A third item in the passenger department was the very heavy California excursion travel from the Eastern states in July. These passengers were carried at very low rates and the aggregate movement over the single-track lines west of Colorado, and especially west of Ogden, was doubtless the

heaviest passenger movement ever carried over lines of that character.

A number of states now have laws requiring the transportation of bicycles in baggage cars free, and several large railroads now take them free voluntarily.

One of the most noteworthy rate reductions in 1897 was that made by the roads leading to New York City through New Jersey on fresh milk. This reduction was made in May, in accordance with an opinion rendered by the Interstate Commerce Commission, although the opinion was not enforced by legal process.

The states of North Dakota and South Dakota have each tried to reduce freight rates generally on the railroads in their respective domains, but injunctions, issued by the United States courts, have stayed the hands of the commissioners for the present.

At New Orleans, heavy fines have been imposed by the United States Court on railroad officers (and paid) for discriminating in favor of certain large shippers, and in Texas two or more railroad companies have pleaded guilty and paid large fines under the state law for illegally discriminating in rates for the transportation of cotton.

Freight bureaus, organized by the merchants of large cities for the purpose of systematizing their dealings with railroad companies and strengthening their positions as related to competing cities, appear to have become an established feature in American business. One of the oldest functionaries in this line has been called from one city to another at a large increase of salary, and the commissioners of various cities have met and organized a National Association of Freight Commissioners.

The Interstate Commerce Commission has investigated the disturbing practice, common among the large roads terminating in New York, of giving excessive free storage on some kinds of freight, but the investigation is unfinished. It has also investigated irregularities in rates on grain for export, but has made no specific recommendation. The general work of the Interstate Commerce Commission has already been fully reported in the *Railroad Gazette* (Dec. 24, p. 907). As the Commissioners are disinclined to discuss traffic matters except on the basis of trying to cure all abuses by the instrumentality of a central administrative board, their annual report becomes substantially a plea for additional power, and little else.

The question whether we are to have pooling legalized has made some progress during 1897, but it is still impossible to predict what the outcome will be. The members of the Interstate Commerce Commission are divided on the subject and their voice is uncertain, so that Congress, which ought to be able to look to them for enlightenment, must act as best it can on its own investigation. There is no evidence of any decided change of heart or accession of knowledge on the part of either senators or representatives, but we have said that the discussion has made progress simply on the strength of the more general and vigorous participation in it that has been observable in the magazines and newspapers. This general discussion, if kept up, must sooner or later convince the doubtful, and the careless, of the fundamental truth that pools are the only instrumentality yet discovered for making stable the rates on freight traffic which is subject to the severe competition that exists at our large cities.

Connecticut Steam Trolley Rivalry.

The official announcement is made by the Vice President of the New England Railroad Company that the third-rail system of that line, which has been operated for most of the past year between Hartford, Conn., and New Britain, a distance of about 10 miles, will soon be extended some nine miles westward to Bristol. The New England Company's decision merely registers that of the controlling corporation, the New York, New Haven & Hartford (Consolidated) Company, and is almost tantamount to an official assertion of the success of the third-rail experiment so far as it has been tested.

It is true that thus far no complete figures have been given to indicate the returns on capital invested in the new enterprise. It is true likewise that, as yet, it has had no test of severe winter weather, and also that up to a few months ago there was no trolley competition with it between the two terminal cities. Something also must be allowed for the attractive novelty of the third rail during the first few weeks of operation. But, on the other hand, its service has been maintained without interruption; opened on May 24 of last year, it had carried up to Nov. 1 414,000 passengers and a daily average of 2,587 passengers, as compared with 750 passengers a day under the old steam system; and its receipts have been $258 70 a day by electricity as compared with $135 a day by steam. With ample power ready for supply at its Berlin powerhouse the fiscal grounds on which the Consolidated Company justifies the extension to Bristol are obvious.

A year ago (Jan. 1, 1897) there was outlined in the columns of the *Railroad Gazette* a group of steam roads in central Connecticut, all under the control of the Consolidated Company, and which might not remotely be electrified should the third rail prove a success. Included in the group were the Middletown branch, the New England main line between Hartford and Waterbury, a part of the New Haven & Northampton, the Waterbury, Meriden & Cromwell road, and that part of the Naugatuck division in the neighborhood of Waterbury, including the Watertown branch. The group of prospectively electrified steam roads contained about 123 miles, so situated that a large part of the mileage might be operated at two power houses—one at Waterbury, the other already at Berlin. Since that forecast was made a year ago the Hartford-New Britain third-rail line has been opened and the extension to Bristol will mark another step in the electrifying of the group. The next points of electric application by the Consolidated Company seem likely to be the Meriden, Waterbury & Cromwell road and, in whole or part, the Naugatuck Division.

The first of these is a road of the "cross-country" type, reaching from Waterbury to the Connecticut River at Cromwell, a distance of about 30 miles, and touching the city of Meriden, whose manufacturers originally supplied the capital to build it as a freight competitor with the Consolidated. Opened in 1885 and leased to the New England, it served its purpose for a few years until the Consolidated bought the New England control, when it was sold under foreclosure proceedings to Judge A. H. Robertson, of New Haven, who discontinued its operation and holds it, as is pretty well understood, acting as an agent of the Consolidated company and awaiting its orders. It is the only railroad in the state not operated, and naturally its discontinuance under the circumstances has provoked local feeling, and two towns through which it runs are trying to "put on the screws" by assessing it for taxation, on the ground that it pays no taxes to the state. Unless reopened in the meantime, it is pretty sure to be assailed in the next legislature. But Judge Robertson is quoted as saying that, ere long, it will be equipped with the third rail and operated from Waterbury. The situation goes to confirm his statement, and the road is apparently waiting only for the maturing of electric plans of the Consolidated company in the Naugatuck Valley.

In the latter region the case is much more suggestive and important. The Valley, with its Housatonic adjunct, is about 56 miles long, and through it runs the Naugatuck Division of the Consolidated Company under a 10 per cent. lease on stock, with large freight and passenger traffic, and touching such important places as Winsted, with about 10,000 inhabitants; Torrington, with about 12,000; Waterbury, with about 40,000, and Ansonia, Derby and Shelton, with about 20,000 more, besides several minor active factory towns. Trolly parallel companies have attacked the prosperous road sharply. The Waterbury Traction Company has paralleled the steam line for eight miles and threatens the Watertown branch; a close parallel opened last summer reaches 10 miles between Torrington and Winsted; and what is in effect a branch of the Bridgeport Traction Company only waits what is likely to be a favorable decision of the Connecticut Supreme Court on appeal for extension between Stratford to Ansonia, to Derby and to Shelton, 10 miles more. About one-third of the steam road is paralleled now by operated trolleys, and one-half of it is pretty sure to suffer trolley rivalry ere long. At trolley terminals in the valley the effects on steam passenger traffic has been almost deadly. Between Waterbury and Naugatuck, for example, the figures some time since showed a decrease of almost 88 per cent. as the result of trolley competition.

Unless, therefore, the Consolidated Company is prepared to surrender its local passenger traffic in the Valley, and perhaps more remotely part of its freight traffic also, it must use electric traction on its Naugatuck Division. That region, indeed, seems pretty clearly marked out as one for much larger application of electricity to an old steam road than the Consolidated Company has hitherto adopted.

Although several suits are pending in Connecticut courts under the general street railroad law on the question of convenience and necessity of projected trolley roads, the long contest of steam and trolley in the state has reached a stage where its intensities are localized rather than general. The fact is due more to the exhaustion of legitimate trolley territory, and, consequently, of trolley enterprise, than to any other single cause. On the first of January, 1897, there were in the state trolleys chartered or definitely projected representing about 350 miles, or about the mileage then actually in operation. The legislature of 1897, which adjourned last June, chartered about 168 miles, of which 92 miles if built would have parallel steam roads. Yet, out of all this authorized mileage, the last report of the Connecticut Railroad Commission just issued shows less than 33 miles actually constructed during the year ending Sept. 30, 1897, and most of that mileage extensions of old lines. "Cross-country" trolley building in the state has almost ceased, and the points of conflict now are the inter-urban extensions, which the Consolidated Company for years so long and successfully resisted both in the legislature and the courts. A novel phase of this inter-urban rivalry is the opening, within a few days, of the long trolley parallel of 17 miles between Hartford and Rockville, which the Consolidated Company intends to meet by a service with a composite car and steam motor. Thus the old conflict has changed, not merely in dimensions, but in its character. Where the Consolidated Company used to fight trolley building, it now has before it the problem of adapting the new motive forces to resist trolleys already built, and competition as a weapon has superseded prevention.

The Brooklyn Dry Docks.

Until more accurate information is at hand concerning the history of the construction of Dry Dock No. 3, at the Brooklyn Navy Yard, it will be just as well to suspend judgment as to where the blame belongs. The facts disclosed by the repairs in progress, while they reveal a bad state of affairs, are not in themselves of a character to establish fraud or incompetency on the part of the dock's constructors. The leaks appear in the nature of quite large concentrations of water in motion through the quicksands by which the bottom of the dock is partly surrounded, and not due primarily to defective material or workmanship in the structure. Dock No. 2, which lies near and parallel to No. 3, and is similar to it though smaller and older, until recently was free from leaks of this nature, but now there are signs of considerable leakage and very serious settlements in the paved quay surface between the two docks, on the opposite side of No. 3 from where the greatest leak occurred.

The dock entrances, that is to say the channels that connect with the outer basin, are flanked with concrete sea walls, also said to be defective, which extend right and left, protecting the quays. It is alleged that when the construction of No. 3 was undertaken the existence of very bad bottom on the right of the entrance was known and a single row of heavy sheet-piling was resorted to as a means of stopping the subterranean flow. It is now evident that this protection, even if sufficient as a method, did not extend sufficiently far to accomplish its purpose and it is being extended and replaced where defective. Two additional parallel rows are also being driven in the effort to seal the leak and similar measures are being taken on the left of the entrance, between the two docks. A temporary bulkhead has been built across the entrance and the dock pumped out, disclosing the condition of the floor and altars. The repairs to the dock itself, which is built entirely of wood, have not yet been commenced and an opinion cannot be hazarded as to their probable extent.

It is quite evident, in view of these facts, that the dock's failure may be a matter quite apart from the contract under which it was built, and as it appears that under the system in vogue in the navy it may have been actually designed without knowledge of the local conditions by others than those to whom its construction was afterwards confided, and that the sea walls may have been separately designed without any intention of having them form a part of the substructure to protect the dock, the question of the responsibility for the outcome becomes more and more clouded. Then, too, there are stories afloat concerning material for the dock itself, that is said to have first been rejected when offered by the original contractor, but afterward accepted from his successor.

Altogether the whole matter has an ugly look and calls for the most searching and unsparing investigation by a Congressional Committee. A court of inquiry would not do; the time for that is passed and too many of the Civil Engineers of the Navy have been from first to last connected with the Brooklyn docks to render that course desirable, or useful or convincing. The investigation should be conducted on very broad lines, moreover, for many questions concerning the applicability of such sites and such forms of construction as have been heretofore adopted by the Navy for dry docks should be elucidated at this time, before the government embarks in any more attempts of this character.

In the January number of *Cassier's Magazine* is a review of British labor conditions by Mr. Benjamin Taylor, under the title "The Blight of Trade Unionism," which is of great general interest at this moment when English manufacturers are in the midst of the strike brought on by the Amalgamated Society of Engineers. The average American has but little conception of the disadvantage under which the English employer works, due to the delays caused not only by disputes between the employers and the trade unions, but also by the disputes which are constantly occurring between the different trades themselves. Mr. Taylor takes the ground that the trade unions in Great Britain have had the effect to retard all branches of industry in which they have secured a hold, and that in certain cases the cost of production has been so enchanced through the action of these societies that it has resulted in driving out of the country numbers of the best workmen, besides opening the English markets to foreign manufacturers, who are thus able to sell goods for less than they can be produced for in England. The result has been that England has in certain instances lost entirely what were once prosperous industries through the action of the trade unions. The members are virtually slaves to their own several societies, or rather to their paid officials, and work under the conditions laid down by the unions, and under these alone. The object of the British trade union is not to get the highest pay for the highest merit, but the highest pay for the lowest merit; the inefficient worker receives more than he is worth, while the more efficient man is put on a level with the least efficient, and is not allowed to develop himself. The total efficiency of a shop under such conditions therefore becomes that

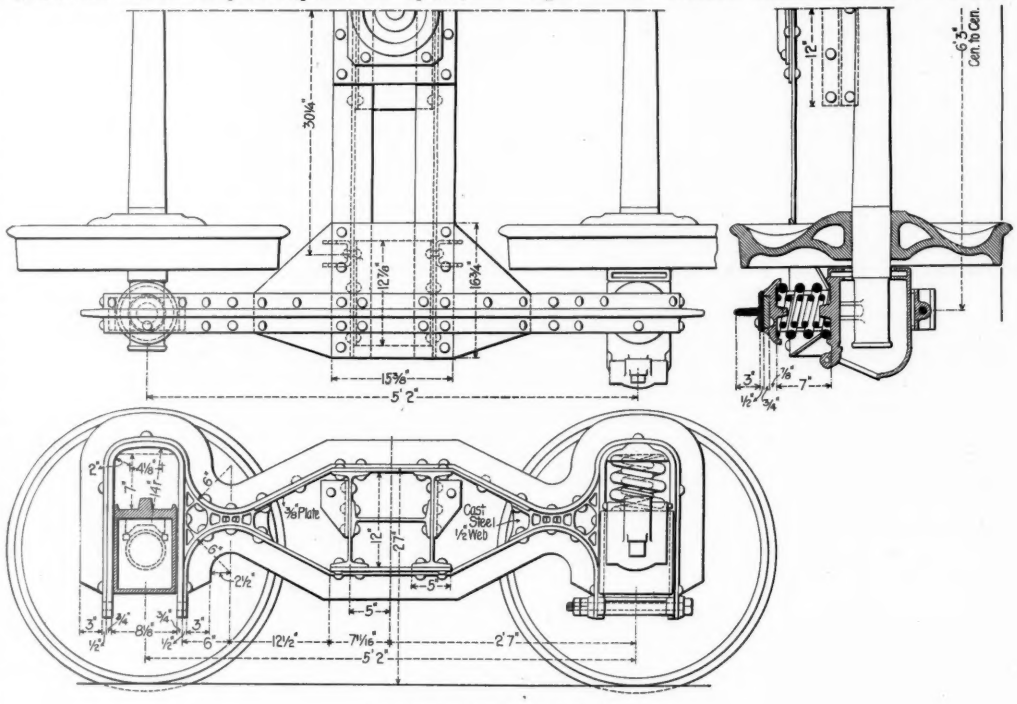
of the poorest workman, while the main principle of these unions seems to be for every workman to get as much pay as he can out of his employer, and in return do as little work as possible. The trouble, however, has not always been between the employers and the unions, but Mr. Taylor states that of late years there have been more quarrels and stoppages of work, in the engineering and shipbuilding trades, among the different societies themselves, than have occurred between the unions and employers; and further, that these disputes threaten the whole existence of England's industry, disturb the calculations of the employers, increase the cost of work, and annoy customers by delays. Numerous interesting examples are given of disputes which have arisen as to what trade shall perform certain operations, what trade shall work certain new tools, etc., which have resulted in much ill-feeling, jealousy and dissension among the different societies. A strange thing, is that where such disputes have been submitted to arbitration only in a few of the cases cited did the losing side abide by the decision of the arbitrating committee. Illustrations are given where the blighting influence of trade unionism has resulted in the total destruction of once prosperous industries, notably that of lace-making and the flint-glass trade. This article is able and is particularly satisfactory because of the careful manner in which its author has presented facts, and it repeats precisely what Mr. Maxim and other authorities have been saying for years. In view of the increasing demand for American products and machinery in foreign markets, it has especial interest in helping to explain some of the fundamental causes which are tending to crowd British manufacturers out of the world's markets, the consequences of which will naturally fall most heavily upon the workmen themselves. Under the circumstances American manufacturers can do little else than to profit by the experience of their less fortunate English competitors and take steps to secure a more stable footing in foreign markets by filling promptly such orders as are taken with goods of the best material and workmanship.

The roads carrying freight from Chicago and St. Louis to Texas, after several months' trial, have abandoned their tariff for carrying bulky freight by the cubic foot. As tariffs of this kind have been in use by the roads in the Western Freight Association right along (and, we believe, without serious complaint), we have made inquiry concerning the Texas set-back, and find that the trouble is not in the tariff, but in careless or unfair applications of it. The space tariff, designed to put a stop to such glaring irregularities as making the same price for a car of 3,500 ft. capacity as for one of 1,800 ft., is prescribed to be used for small cars only when large ones cannot be had, and only when the shipper really wants a large one; but there are chances to apply carload rates to small lots now and then, if an agent feels disposed to make a concession to a favorite shipper in that way, and it looks as though some such trick has been played with Texas shipments. Shading of rates is sure to upset agreements, whatever the means adopted for doing it, and so, of course, the A B road, as soon as it discovered that this was the way the C D road had taken to cut rates, declared that the agreement to use space rates must be given up. But it seems likely that nine-tenths of the cutting was due to ignorance of the rules more than to a desire to overreach, and it is to be hoped that the tariff will be more fully explained and speedily readopted. This mitigation of the large car evil is too valuable a measure to be hastily thrown aside. One trouble was that the Texas tariff already had a provision partly equalizing the rates for cars of different sizes, in the shape of a rule advancing minimum C. L. weights three per cent for each foot in the length of all cars more than 40 ft. long. The space tariff took account of width and height, as well as length, and so made this increase about six per cent. This discrepancy, of course, produced constant confusion. Again, the Texas lines seem to have carelessly adopted a space-tariff rate which practically reduced their charges on all bulky shipments. It was based on the assumption that the old carload rate paid for 3,800 cu. ft., whereas it paid, in practice, for only about 2,800 ft. for the reason that few if any 3,800-ft. cars were in service. Such a marked reduction when there was no call for it was justly the cause of much dissatisfaction. The capacity rate, as distinguished from the single arbitrary rate for cars of all sizes, was described in the *Railroad Gazette* last June (page 399). It deserves more attention than it receives, for it is good both for shippers and railroads, a quality not always recognizable in freight tariffs. It is good for the shipper because, as hitherto adopted, it gives him the same advantage in price on bulky articles as though the railroads at once built a full supply of very large cars; and it is good for the railroads because it saves them the cost of building such cars and, what is more important, saves the loss that would result from having to keep constantly on hand a variety of sizes of cars.

A press dispatch from Kansas City says that the railroads west of that city have receded from their determination not to carry passengers on freight trains. All the roads west of the Mississippi River had agreed, in connection with the pass agreement for 1898, to issue no more permits to traveling salesmen and others allowing them to ride on freight trains; but the jobbers and manufacturers of Kansas City made a strong protest, and Mr. Trickett, Commissioner of the Transportation Bureau, now says that nearly all the roads have agreed to continue the existing custom. It is to be regretted that the railroads could not carry out their original plan. The privilege which they attempted to withdraw, and which is now claimed by the merchants as such a valuable one, is not that of riding on regular passenger-carrying freight trains; that privilege is open to everyone, and there is no intention of disturbing it. On the minor lines, where passenger travel is light and passenger trains are few, the railroads generally, and for many years, have authorized the carrying of passengers, either in cabooses or in passenger cars attached to certain freight trains, and this is regularly published on the timetable. The merchants, however, were not satisfied with this and gradually succeeded in getting for their drummers special permits allowing the holder to ride on *any* freight train stopping at the station where he desired to go Of course this caused much inconvenience on account of the necessity of stopping the train with the caboose at the station platform. With a long freight train this might often produce a delay sufficient to interfere with the dispatcher's arrangements for meeting points and perhaps waste valuable time of several other trains.

The Black Diamond Steel Truck.

The engraving shows a steel truck built up of commercial shapes, for which patent was issued Dec. 27, 1897, and which is controlled by the Bloomsburg Car Manufacturing Co., of Bloomsburg, Pa. This truck has been specified on 10 gondola 60,000-lb. capacity cars now building. The design is so apparent in the engraving that description is hardly necessary. The arch bars in the truck shown are 5 in. × 3½ in., 16-lb., Pencoyd Ts. The transoms are of 12-in. eye-beams, but channels may be used. Extending the transoms and gusset-plates outside the arch bars helps to keep the truck square, and the wheels, brakebeams and hangers can be readily seen by inspectors.



The Black Diamond Steel Truck.

Progress of Municipal Improvement in Philadelphia.

The work of widening Delaware avenue from South street north to Vine street progresses very slowly. Although the contract was awarded over four months ago, and the time limit is 18 months, yet little more than a beginning has been made. Of the preliminary work some dredging, gravel filling, and pile-driving for the outer wall has been done from the line of the Reading Railroad piers as far north as Chestnut street, probably about 200 ft. in all, and work of a similar character has been done at the foot of Arch street. The contract price for the entire work is $426,000, awarded to D. & J. P. McNichol.

The Pennsylvania Railroad has temporarily abandoned its South Ferry at Market street, and is tearing out the old piling and building walls to conform to the new bulkhead line. It is stated that the railroad company proposes building a new double-decked ferry house at this point to met the demand for improved ferry service. This will enable the Traction Company to extend its lines, by means of a bridge, over Delaware avenue, and handle its passengers directly at the door of the ferry house. Armstrong & Pintzinghoff have the contract for the railroad work.

The Highway Bureau opened bids last month for a large amount of work for 1898. The most interesting of these was for building the masonry approaches to Penrose Ferry Bridge. Owing to the nature of the soil and the special liability of the work being destroyed during construction by heavy freshets, many contractors were unwilling to attempt it, and there were only two bids, one amounting to $39,900 and the other $57,600. A peculiar feature of the specifications was the use, entirely novel in Philadelphia practice, of expanded metal for covering the pile heads which support the concrete foundations of the piers.

Reading subway work shows substantial progress. Nearly all the excavations have been completed for the freight and passenger stations at Broad and Fifteenth streets. All the underpinning has been done from Broad street as far west as Twenty-second street, with the exception of a small section under the machine shop of Bement Miles & Co. As the excavation there has been through solid rock to a depth of about 30 ft., the work necessarily consumes some time. From Broad street as far west as Twentieth all the retaining walls are in place. The bridge walls and abutments for the intersecting streets are nearly complete and on Broad street the steel superstructure is being rapidly placed in position.

E. D. Smith & Co., the contractors who will have the core to remove, have several steam shovels in position, and will commence active operations with them this week.

The following are some of the unit prices for the work:

Rubble masonry above neat line	$6.50 per cu. yd.
Coursed ashlar masonry above neat line	9.00 " " "
Rubble masonry in foundation	6.50 " " "
Rock-faced ashlar for bridge abutments	9.80 " " "
Brick masonry in concrete for underpinning	12.00 " " "
Concrete masonry for underpinning	8.50 " " "
Rubble " " "	10 00 " " "
Concrete masonry in place	6.00 " " "
Excavation—rotten rock and earth mixed	1.60 " " "
Y. P. flooring temporary bridges	.30 cts. per 1,000 ft. B. M.
Piles per lineal foot	20 cts. to 50 cts.
Time average, 18 months.	

TECHNICAL.

Manufacturing and Business.

Charles F. Pierce has been appointed Eastern Sales Agent for the Monarch Brake Beam Co., of Detroit, Mich., with headquarters in the Havemeyer Building, New York City. We have previously announced the appointment of Harry W. Frost as General Sales Agent; his headquarters will be in the Old Colony Building, Chicago.

The Eyeless Tool Co., Havemeyer Building. New York City, has been awarded a contract to furnish all track tools and eyeless picks needed by the Atchison, Topeka & Santa Fe for the current year.

Neilson & Co., of the Hyde Park Locomotive Works, Glasgow, announce that the designation of the firm is now Neilson, Reid & Co, the constitution of the firm remaining as at present.

The plant of the Rhode Island Locomotive Works at Providence, R. I., was sold at auction Jan. 6 and bought by John H. Mason & Sons for $130,000.

In our issue of Dec. 24 we noted the incorporation of the American Pegamoid Co., for the purpose of making and dealing in waterproof materials. The following Directors and officers have been elected: John A. McCall, Joseph J. Byers, Arthur W. Pope, G. I. Herbert, Col. John J. McCook, John T. Collins, Col. Albert A. Pope, John R. Bartlett, Conrad N. Jordan, E. F. C. Young, and Thomas A. McIntyre. The Directors elected the following officers: Joseph J. Byers, President; Arthur W. Pope, Vice-President; G. I. Herbert, Treasurer; W. C. Van Antwerp, Secretary, and James W. Murphy, Assistant Secretary. Mr. McCall was elected Chairman of the Board of Directors and of the Executive Committee, and Col. Pope Chairman of the Committee on Manufacture and Commerce.

G. P. Nichols & Bro., Monadnock Block, Chicago, have been appointed Sales Agents for Pawling & Harnischfeger, of Milwaukee, Wis., manufacturers of

traveling cranes. Nichols & Bro. will still continue to represent the Jeffrey Mfg. Co., of Columbus, O.

The S. A. Woods Machine Co., of Boston, manufacturer of wood-working machinery, has enlarged its business by the organization of a new department. It has joined with the Carse Bros. Co., of Chicago, in the manufacture of a line of special car building machines designed by David B. Carse, General Manager, and O. E. Ahlander, late chief designer of Greenlee Bros. & Co., of Chicago. Mr. Carse is the Manager of this new department, called the Car Department. Mr. John B. Carse, his brother, is Assistant Manager, with headquarters at 64 Wabash avenue, Chicago, while Mr. Ahlander is Superintendent of the department at the company's works in Boston. They have recently equipped the new shops of the Consolidated Cattle Car Co., at Corwith, Ill., and furnished machinery for the Middletown and Norwich, N. Y., shops, of the N. Y., O. & W. Ry. They are now building their newly-designed hollow-chisel mortising and high-speed boring machines for the Howell shops of the L. & N. Ry. Co., and the Buffalo shops of the L. S. & M. S. Ry.

The Pennsylvania Railroad has ordered 100,000 tons of rails, as follows: Pennsylvania Steel Co., 25,000; Cambria Iron Co., 25,000; Carnegie Steel Co., Limited, 30,000; Lackawanna Iron & Steel Co., 5,000, and the Illinois Steel Co., 15,000 tons. A part of the order is for 100-lb. rails in 60-ft. lengths, but we understand the larger part is for 80-lb. rails in 30-ft. lengths. The whole of the order was not placed at $18, as reported in the daily papers.

At the annual meeting of the Chicago Pneumatic Tool Co., held at Chicago Jan. 11, J. W. Duntley was elected President, J. E. Duntley Vice-President and Leroy Beardsley, Secretary and Treasurer. A quarterly dividend was declared. The company has received cable orders from Europe during the first 10 days of this year for 30 Boyer piston air drills, 30 No. 2 Boyer hammers and 5 riveters. Its American trade has also increased over 50 per cent.

The Port Wardens' Committee on Improvement of the Delaware River wharves has received applications from the Philadelphia & Reading railroad for the filling up of the dock piers between piers 27 and 28, north, and from the Philadelphia Grain Elevator Co. for the extension of the new pier headline of the elevator pier at the foot of Ann street, Philadelphia. The proposed pier extension would provide for a storage capacity for 500,000 more bushels of grain.

The Epping-Carpenter Co., manufacturers of steam pumps, Pittsburgh, will enlarge its plant by building a new machine shop 100×200 ft. and other smaller buildings. Plans are being prepared by Samuel Diescher, Hamilton Building, Pittsburgh. The plant will be located on Butler street and will be equipped with new machinery.

Chester B. Albree, Allegheny, Pa., has received a contract for 17,000 ft. of iron railing weighing 60 lbs. to the foot for the Harlem River driveway, New York. Mr. Albree has lately received several orders for the Pittsburgh riveting machines and is now increasing facilities for making these by installing new machinery and traveling cranes. Charles G. Eckstein & Co., 45 Vesey street, New York City, who have branch houses in Vienna, Brussels and Berlin, will act as agents in charge of the foreign trade.

The plant of the United States Car Co., at Hegewisch, Ill., has been ordered sold at auction Jan. 31, in accordance with the plan of reorganization, recently referred to.

Fitz-Hugh & Co., 1634 Monadnock Building, Chicago, is offering for sale engines used on the Lake Street Elevated, Chicago, which are particularly adapted for lumbering roads using medium weight rails and having sharp curves. The company has recently sold some of these engines to the Hand Lumber Co., Dolive, Ala.; Bluff City Lumber Co., Pine Bluff, Ark.; Little Bay Lumber Co., Little Bay, Ark.; Camden Lumber Co., Elliot, Ark.; East Coast Lumber Co., Lake City, Fla., and W. T. Jay, Madisonville, La.

The Davis & Egan Machine Tool Co., of Cincinnati, finding it necessary to increase its capacity, has secured the plant formerly occupied by the Walton Iron Co., in Covington, Ky. The building is 300 ft. long×100 ft. wide, and with adjoining ground occupies one block. The building is of modern construction, and will be equipped with an electric traveling crane, electric generators, air hoists, hot air system and all modern appliances. The new plant will be used as an addition to the Cincinnati works of the company, and will be used for the manufacture of large lathes, planers and boring mills. As it is located on the Chesapeake & Ohio Railroad, with tracks running into the works, the shipping facilities are excellent. It is expected that the plant will be in operation within 60 days, employing a force of 300 men, and making a total of 1,100 employees in the three plants.

The bolster and drawbar springs made by the Anderson Du Puy Co., of Pittsburgh, were specified on the 1,000 refrigerator cars ordered by the Armour Co. from the Wells & French Co.

The Griffin Wheel Co., Chicago, has begun the construction of a brick and stone addition to its plant, located at Lake street and Sacramento avenue. The building will be 300 ft. long, 50 ft. wide and 20 ft. high, and it is said will cost about $14,000. Ralph and Sumner Sollitt have the contract.

The new steam heating plant for the University of Illinois, mentioned in our issue of June 25, 1897, has now been completed and began last week to supply the various buildings on the campus with steam. The boilers for this plant were furnished by the National Water Tube Boiler Co., of New Brunswick, N. J., and the Murphy Iron Works, of Detroit, Mich., put in the automatic self-feeding smokeless furnace. It is said that the electric lighting plant will be completed within a few weeks.

Iron and Steel.

It is stated that the plant of the Troy Steel & Iron Co., at Breaker Island, near Troy, N. Y., which stopped work late in December, has been practically abandoned, being unable to compete with Pennsylvania firms at present prices.

The plant of the Eureka Cast Steel Co., at Chester, Pa., which has been in the hands of a Receiver for over a year, has been ordered sold at an upset price of $21,000, the amount of the first mortgage.

The Peoria Rolling Mills at Peoria, Ill., were sold Jan. 4 to Geo. T. Page, representing the reorganization committee of former stockholders, who will turn the property over to the newly organized Peoria Iron & Steel Co. The works have been inactive for two years, but the plant is now being put in order for working. J. B Greenhut will be President of the new company and Geo. J. Gibson, Manager.

New Stations and Shops.

The station of the Vandalia Line at Logansport, Ind., was destroyed by fire last week, and will probably be rebuilt at once. The loss is estimated between $10,000 and $12,000.

Car Lighting.

The National Electric Car Lighting Co. (axle light) has received an order from Mr. Ripley to equip three United States postal cars, now building at Topeka, for service between Chicago and Kansas City on the Atchison.

Equipment.

It will be remembered that two weeks ago we published a statement of the probable equipment needs of the standard steam railroads for the next half year. While prosecuting that inquiry we also gathered some information from street railroads and private car companies. Street railroad companies operating about one-quarter of the total mileage of the country replied that they would need 900 cars in the half year. Private car lines, representing a total ownership of about 29,000 cars, would require 930 new cars in the half year.

A "Composite" Motor Car for the Erie.

The Erie Railroad has received from the Schenectady Locomotive Works a composite car similar to that built for the New England Railroad and described in our issue of Oct. 22, 1897. It will be used on the New City branch of the New Jersey & New York Railroad, running from New City to Nanuet, taking the place of a regular train.

An old car was taken and practically rebuilt. The boiler is upright, with an outside diameter, at the smallest ring, of 53⅜ in., with 314 tubes, 1¼ in. outside diameter, No. 13 B. W. G., and 4 ft. 9 in. long and fitted with two Crosby pop valves and Sellers' injectors; firebox, 45⅝ in. diam.; rocking finger grates; grate surface 11.23 sq. ft.; cylinders, 12 × 16 in.; driving wheels, 42 in diam; rigid wheel base, 8 ft.; journals, 7½ × 9½ in.; weight on drivers (front end of car), 74,900 lbs.; weight on opposite end, 39,900 lbs.; total, 114,900 lbs. There are two water tanks, each with a capacity of 750 gals. The height of the stack is 14 ft. 6 in. above rail. The car is 50 ft. long and 9 ft. 6 in. wide and equipped with Janney-Buhoup coupler on back end and Janney tender coupler on front end, Westinghouse air-brakes and train signals and Erie system of steam heat (live steam direct). The baggage and engine room of the car is 8 ft. 10 in. × 17 ft. 9 in.; passenger compartment, 8 ft. 8½ in. × 31 ft. 5 in. The car is lighted by electricity furnished by a Pyle-National electric headlight motor. Fourteen 8 c. p. lamps are used in the passenger compartment and one 32 c. p. street car headlight for the front end of the car. The car seats are 19 in number, of the reversible Forney-Scarritt rattan pattern. The inside finish is ceiled with three-ply oak veneer head-lining decorated in white and gold; the interior finish is mahogany.

The New City branch of the New Jersey & New York Division of the Erie Railroad runs from Nanuet to New City, a distance of 4.1 miles. The Erie runs a few trains between the terminal points every day, but the passenger and freight traffic is very light, and the company has desired for some time to secure a motor car which will do the work that is now being done by a locomotive, a baggage and smoking-car combined, and a passenger car, requiring altogether the services of five men.

National Switch & Signal Co.

After Feb. 1 the general correspondence and management of the National Switch & Signal Company will be removed from Easton to their New York office, Room 1403, 43 Cedar street. All correspondence except that directed to the Secretary, Treasurer and Purchasing Agent, should be directed to that address after Feb. 1.

Tests of Car Wheels.

At the time of the meeting of the Central Railway Club in Buffalo, Jan. 21, the New York Car Wheel Works will begin a series of tests of car wheels, these to commence at 9:30 a. m. and continue without intermission until completed. Chilled wheels made from special mixtures and of the weights and sizes recommended by the company, for use under locomotives, passenger cars, and 100,000-lb. capacity freight cars, will be subjected to tests under the specifications of the leading European railroads for steel wheels. These tests will be similar to those made in 1895, the results of which have been widely distributed by the New York Car Wheel Works. A primary purpose of these tests is to show the comparative value of steel tired wheels and special chilled-iron wheels for severe service. The European tests specified are as below:

Austrian State Railroad Test.—Wheel placed upright on heavy iron and stone foundation. Weight 475 lbs. dropped from varying heights, commencing at one meter (about 3¼ ft.), and increasing by half meters to six meters (about 19½ ft.) Wheel must stand eight blows in all. Test will be continued until the wheel is broken.

German State Railroad.—Wheel placed horizontally on heavy iron and stone foundation. Tapering steel wedge placed in bore. Weight 475 lbs. dropped from varying heights, commencing at one and one-half meters (about 5 ft.), and increasing by half meters to four meters (about 3 ft.) Wheel must stand six blows in succession without bursting. Test to be continued until the wheel is broken.

French State Railroad Test.—Wheel placed upright on heavy stone foundation. Weight of 2,200 lbs. dropped from a height of four and a half meters (about 14½ ft.). Wheel must stand three blows without breaking. Test to be continued until wheel is broken.

Steel Tests at the "Tech."

Much interest will be taken in tests now beginning in the Laboratory of Applied Mechanics of the Massachusetts Institute of Technology. A series of steels has been obtained having from one-tenth of one per cent. carbon, varying by tenths to nine-tenths of one per cent. There are three bars in each series, 1½ in. in diameter and 18 ft. long. Each bar is cut in three 6-ft. lengths, and each piece analyzed chemically for carbon, phosphorus and sulphur. Two of the pieces of each bar are tested in the tension machine, and one in the torsion apparatus. The elastic limit and modulus of elasticity are determined in each case. This work is done by the students, under the supervision of the professor in charge. This investigation will probably extend over two years. One of the theses for this year will continue work done by Professor Sondericker some years ago, on the character of the elastic changes produced by repeated stresses in different grades of steel. This work will take steels of different degrees of carbon, and test them under heavier stresses than before, to determine what relation, if any, exists between the elastic changes and the structure of the steel, as shown by microscopical examination of etched polished sections.

The Penberthy Injector.

We have from the Penberthy Injector Co., Detroit Mich., the following letter, which explains itself. Of course we knew that this injector is made by the Penberthy Company. The error in the *Railroad Gazette* article was quite inexcusable and we should say unaccountable, did we not realize the incessant vigilance necessary to keep such mistakes out of print. "We notice that in the Dec. 31 issue of your paper, in an article giving results of tests on injectors at the University of Wisconsin, our injector is represented as being manufactured by the Scott Valve Co., of Chicago. As we have been manufacturing this very popular injector for the past 12 years, and are known throughout the length and breadth of the country among steam users of all classes, we hardly feel that the Scott Valve Co. should be given the credit for our machine. They are extensive handlers of it, using large quantities every year, but do not manufacture it.

THE SCRAP HEAP.

Notes.

On Jan. 8 the tugboat "Percy Kelsey" was wrecked by the explosion of its boiler on the Ohio River near Pittsburgh, and 6 of the crew were killed.

In London the post-office is using a motor-car for collecting and distributing mail, which is said to be run at a cost of 4 cents a mile. It carries two tons.

The Cleveland, Lorain & Wheeling has put up a telephone line, with metallic circuit, between Cleveland and Lorain, 54 miles. There are nine offices on the line and calls have been arranged so that a central office is not needed.

Assistant Treasurer Gilson, of the Chicago, Rock Island & Pacific, has issued an order that in the road, water, bridge and building departments time checks must hereafter be signed by the Roadmaster or the Superintendent in charge, and the employee must have an identification card numbered to correspond with the time check.

A press dispatch from Omaha states that the Union Pacific and the Chicago & Northwestern lines have notified connections that in dealing with traffic wholly within the state of Nebraska they will refuse to receive freight cars which are not equipped with air-brakes and automatic couplers, as required by the state law.

Vice-President Andrews, Division Freight Agent Munson and other officers of the Southern Railway in North Carolina have been called before the Railroad Commissioners of that state to answer for being in contempt in refusing to answer questions about reduced rates or free transportation granted during the past year to Railroad Commissioner S. O. Wilson. It would appear that the present order must have come from the two men, Caldwell and Pearson, claiming to act as Commissioners under the recent appointment of the Governor, though according to our last information the former Commissioners, including S. O. Wilson, still held the fort, and Messrs. Caldwell and Pearson had been summoned before the United States Court for contempt in assuming to act as Commissioners.

The Liverpool Docks.

There are now in progress and in contemplation, extensions and improvements in the Liverpool dock sys-

tem which will cost over $21,500,000. The cost of the improvements now progressing will be over $5,500,000, and they include the construction of a new dry dock 920 ft. long, with an entrance of 94 ft. The contemplated new scheme includes the enlargement of a dry dock, now 475 ft. long, to 1,000 ft. long and 90 ft. wide, and the construction of two additional dry docks, one 630 ft. long and 80 ft. wide and the other 620 ft. long and also 80 ft. wide, in lieu of two present small dry docks; the enlargement of a number of wet docks, so as to provide berths for any number of vessels 800 ft. long and for a limited number 900 ft. long, and one dock is to be made sufficiently large to accommodate a vessel 980 ft. long. The entrances for these larger docks are to be made 100 ft. wide.

Roads in New York.

In his message the Governor of New York says: "The opinion is growing that some method must soon be adopted which will improve the country roads. The system now in general use allows the highway taxes to be paid in work. The result is poor roads, with little sign of improvement. Under the law of this state any town or county now has the right to adopt the plan of paying this tax in money. In the few cases in which the latter plan has been adopted the result has given great satisfaction. The money system can be so pursued as to insure the expenditure of a stated amount upon each mile of road in a town, leaving a surplus to be devoted each year to the roads most in need of it. It is urged by many whose judgment and experience are valuable that the Legislature should enact a law compelling all highway taxes to be paid in money. This may finally be done. I would recommend, however, that before such law is passed the towns and counties of the state avail themselves of their privilege under the statute of adopting the money system. The experience thus gained will probably satisfy the farmers that the plan now in use should be abandoned."

Electric Railroads in Connecticut.

The annual report of the Connecticut Railroad Commissioners shows that there are 385 miles of electric railroad in the state, an increase of about 32 miles over last year. The 29 companies have $9,770,440 of stock issued. Their bonded debt is $9,092,800 and floating debt $1,071,421. They carried last year about 43,000 fewer passengers than they did in 1896. They paid in dividends $265,625, as compared with $221,-119 in 1896. The Commissioners say that no more steam roads are likely to be built in Connecticut.

The Midland Railway Car Shops.

The car works of the Midland Railway at Derby, England, covers about eighty-six acres and is the largest plant of the kind in Great Britain. There are thirteen large workshops built of red brick besides office buildings, storerooms and large wooden sheds for seasoning lumber. The wood-working shops are arranged on one side of the works, the iron-working shops on the opposite side, with the erecting shops between. In the wagon shop about 200 trucks 4 wheel open cars are built and repaired each week. In the carrige shop between 50 and 60 carriages are repaired and 10 new ones built each week. Four coach-makers and two apprentices can erect a six-wheel, third-class carriage with five compartments in three weeks ready to be finished by the cabinet makers and upholsterers. The paint shop has a capacity for 280 carriages and 50 carriages are painted or touched up each week. In the iron foundry there are two cupolas which melt 120 tons of iron each week; in the brass foundry 12 crucibles can be heated at one time. There are 13 steam hammers in the forge shop beside nearly 100 forges arranged in five rows. The spring shop turns out about 325 buffer and 500 bearing springs each week. The machine shop is equipped with 300 fixed tools, of which 125 are lathes. Eleven steam engines and one gas engine supply power for the shops. There are also four steam operated transfer tables for moving cars from one shop to another. The total number of men employed at these shops is about 3,620.—*Cassier's Magazine.*

United States Manufactures in New South Wales.

Under date of Sydney, Oct 23, 1897, Consul Bell reports: The general outlook of business is more favorable; the seasons are better, the crops good, the tendency of general business is improving, and American dealers are enjoying a fair share of the increased prosperity. I can congratulate our manufacturers on our increased trade in boots and shoes, hardware, paper, and in various light machinery and household utilities. Our manufacturers have secured the contracts for the machinery for the new street railroads of Sydney, and have stipulated to furnish 2,000 tons of steel rails for the new railroad lines.

Railroads in Venezuela.

The *Venezuelan Herald* publishes the returns for the railroads of that country for the first half of the year 1897 as below:

	Gross earn.	Expenses.
La Guayra & Caracas	$297,299	$142,8?2
Puerto Cabello & Valencia	14?,841	59,042
Great Venezuelan	202,056	158,060
Southwestern	92,894	41,839
Bolivar	93,678	56,569
Central	13,658	14,495
Carenero	14,084	25,252
Santa Barbara & El Vigia	45,663	111,858
Guanta	9,643	8,790

Approach to the Boston Southern Union Station.

The Boston & Providence Railroad Co. has asked the Board of Aldermen of Boston to take action looking to the lengthening of the overhead bridges on the line of the Boston & Albany between Dartmouth street and the present terminal station of the Boston & Albany. To reach the new Union Station, the trains of the Boston & Providence (New York, New Haven & Hartford) will have to traverse the line of the Boston & Albany between the points named, and as there are at present only four tracks on this part of the line, of which two are used for switching or side tracks, the accommodation of the greatly increased traffic will necessitate laying additional tracks. This necessity was recognized at the time the plans of the station were first published, but the cost of the widening will be very great, and until now nothing has been given out concerning the plans to undertake it. It will necessitate not only the reconstruction of 13 overhead bridges, but also the destruction of scores of brick buildings and the rebuilding of high retaining walls for nearly the whole distance, the line being in a cut most of the way.

Statistics of Train Robberies.

Mr. J. W. Shrague, Editor of the *Express Gazette*, has appealed to Congress, publishing his appeal in pamphlet form, to pass a law prescribing the death penalty for train wrecking with intent to rob. Mr. Shrague publishes brief notes of 30 railroad "hold-ups" and 10 of stages during 1897, in which four passengers and trainmen have been killed and four others shot. The pamphlet states that the total number of trains held up in the United States since 1890 is 218, and that in connection with these the number of passengers and trainmen killed has been 78.

Russian Freight Rates.

Press dispatches report that the Russian government has made a reduction of 20 per cent. in freight rates on flour for export and one of 16 per cent. on grain to seaports intended to be ground into meal or flour for export.

It is also reported that a reduction has been made in he rates on petroleum from Southwestern Russia to all important places in Germany.

Chicago River Improvement.

The committee mentioned in our issue of Dec. 17, appointed to prepare a Memorial to Congress asking for the improvement of the Chicago River, presented the memorial to the River Improvement Association at a meeting held on Dec. 30. The memorial was drawn up by a sub committee consisting of Mayor Harrison, M. B. Madden and J. S. Dunham. The report was read by Mr Madden and was adopted without discussion, although a delegation on behalf of fixed bridges was present. The most important part of the memorial is an appeal to Congress to extend the 20-ft. channel which is now being made in the lakes through the Chicago River, and for an amendment to the river and harbor bill of June 3, 1896, making the authorized depth of water in the river 20 ft. instead of 16 ft. as now provided. An appropriation of $400,000 is asked for continuing this improvement. The memorial calls attention to the advantages which will accrue to the entire country from the 20-ft. channel through the lakes and connecting waters, which will be completed this year, and also sets forth the importance of the port of Chicago. It is pointed out that the West cannot have full use of this new channel until the Chicago River is given the same depth, the railroads centering at Chicago making that city the most important point on the lakes. The memorial is an exhaustive discussion of the question of lake commerce, giving valuable statistics of the traffic of the past year and arguing strongly for the amendment asked for. It is expected that a committee representing all the interests concerned will take the memorial to Washington and ask for early action.

Prizes for Working Engines to Full Capacity.

General Superintendent J. H. Olhausen, of the Central of New Jersey, has issued a circular to enginemen and firemen announcing that premiums will be paid each month to the engineman and the fireman hauling the largest number of tons in freight trains between Mauch Chunk and Tidewater (Jersey City), 115 miles. Each locomotive is rated according to the number of tons which it can haul over the several different portions of the road, but the rating is not the maximum load; that is to say, some room is left for the exercise of skill and care on the part of the engine crew in hauling better than the average load. The circular says:

To the enginemen and firemen hauling eastbound a total tonnage in excess of the rated capacity, and making the run within 12 hours, a premium will be paid each month until further notice, as follows:

To the engine crew hauling the greatest number of tons in excess of the total rated capacity, $125. To the engine crew hauling the second largest number of tons . . . $50; third, $25. This will apply only to enginemen and firemen making not less than eight round trips during the month. The premium will be divided: enginemen, 60 per cent.; firemen, 40 per cent.

The schedule of rating from Mauch Chunk to Phillipsburg is as follows: Engines with cylinders 21 × 26, 2,000 net tons; 20 × 24, 2,000 net tons; 18 × 22, 1 400 net tons. Phillipsburg to Hampton, 21 × 26, 1,250; 20 × 24, 1,250; 18 × 22. 800 net tons. Hampton to Tidewater, 21 × 26, 1,500; 20 × 24, 1,500; 18 × 22, 900 net tons. Eastbound trains are expected to leave Penobscot with not less than 1,600 tons.

Bridge Injunctions Dissolved.

On Dec. 31 the two injunctions preventing the electric cars from crossing the Brooklyn Bridge were dissolved. The Appellate Division of the Supreme Court refused to continue the Hearst injunction which has prevented the bridge trustees from permitting the electric roads to build the loop at the New York terminus, and the injunction of T. E. Stillman restraining the electric railroad companies from proceeding with the construction across the bridge structure was dissolved by Justice Van Wyck. Since then work has rapidly progressed. The four loop tracks has been rapidly laid, tho overhead wires are partly in place and the other necessary work is being rapidly completed. Cars will not be placed in regular service, however, until the road widening (shown on diagram of our issue of Sept. 24, 1896) has been completed, which will probably be in about three weeks.

The Population of Japan.

A consular report says that the investigations of the Home Department of Japan showed the population on Dec. 31, 1896, to be 42,708,264. The increase as compared with the year before was 437,644. This does not include Formosa.

Broiled Chicken Without a Dining Car.

The drawing-room cars of the New York, New Haven & Hartford, running between New York and Boston, now have in their buffets gas broilers, from which passengers can be served with broiled chicken, steaks and chops at all hours. The five o'clock evening trains have dining cars, and of course the buffets are not needed; and the 9 o'clock morning train will not be equipped until next week, but all the other trains have them. Mr. Crane, the Superintendent of this department, becoming impressed with the fact that passengers have got tired of eating luncheons made from the limited list commonly found in buffets, conceived the idea that a broiler could be added to the Pintsch gas apparatus for heating tea and coffee, and the Safety Car Heating & Lighting Co. carried out his idea by making a broiler with three ovens or spaces, to be placed beneath the ordinary coffee urn. The wire holders which contain the meat are held in a vertical position, as in an ordinary gas broiler, and three of them can be used at one time. Each broiler holds portions for two persons, so that six can be served at once. The porter also carries a stock of boiled potatoes which can be heated and browned in the broiler and served with meats.

Acetylene Gas Explosion.

On Friday noon, Dec. 30, an explosion, or rather a series of explosions, totally destroyed the works of the United States Liquified Acetylene Distributing Co., in Jersey City, N. J., in which the Chief Engineer and Superintendent were killed. The fire resulting did some damage to the trestles and sleeping cars of the Pennsylvania Railroad in the vicinity. Many persons were injured in one way or another by the explosion; most of them, however, very slightly. The buildings occupied by the Acetylene Distributing Co. were erected about 10 years ago by the National Ice Machine Co. for the manufacture of ice machines. The Acetylene Co. leased the building in May, 1895, for three years, and it was not generally understood that the building was to be used for generating gas. When this was known, however, the fire insurance companies refused to insure many of the buildings in the vicinity, and some of these were damaged slightly in the explosion. The exact cause of the accident so far is a mystery, but the most plausible explanation is, that one of the distributing tanks near the engine house leaked and the acetylene gas took fire from the furnace. The first explosion was very violent, and was followed by many others in quick succession, and although the firemen were soon at the scene of the accident, the water only caused the calcium carbide to form more gas, and instead of quenching it increased the flames. This is the most serious explosion of acetylene gas that has happened to our knowledge in this country, and will result in causing it to be handled even more cautiously than heretofore. Last week the Board of Fire Commissioners of Jersey City adopted the following provisions regulating to the manufacture and storage of acetylene gas.

"That the manufacture of carbide of calcium or the liquefaction of calcium of carbide be prohibited except under certain prescribed limitations to be designated by the Board. That it declines to permit the use of any acetylene gas regenerator in this city except those devices first submitted to the Board for careful test, examination and approval of the Board. That after the careful examination made into the methods of operation of the Bournonville gas regenerator, and finding the same to be operated on safe scientific principles, and in view of the small quantity of carbide treated by said device and the careful storage and distribution of the same, that the embargo laid by the Board against the use of this machine be withdrawn and its operation sanctioned, provided that the methods now employed be not altered or made more dangerous. It is further provided that the use or storage of calcium of carbide be confined to quantities of five pounds each, which must be stored in heavy block tin vessels, and until ready for use hermetically sealed, and that no dwelling, factory or other building be permitted to keep on storage a total quantity in excess of 25 lbs. in cans or vessels of 5 lbs. each.

Baltimore & Ohio Presidents.

The recent annual meeting of the Baltimore & Ohio was its 71st. The B & O. has had 10 presidents in 71 years as follows: Philip E. Thomas, Louis McLane, Thomas Swan, William C. Harrison, Chauncey Brooks, John W. Garrett, Robert Garrett, Samuel Spencer, Charles E. Mayer and John K Cowen. The line was put in operation to Harpers Ferry in 1834, was built to Winchester, Va., in 1836 and to Strasburg in 1870. Westward it went to Cumberland in November, 1842, and on to Wheeling, W. Va., by Jan. 1, 1853. The Parkersburg Branch from Grafton to Parkersburg was opened May 1, 1857.

A Chicago Libel Suit.

The Northwestern Elevated Railroad, Chicago, has brought suit against the *Chicago Daily News* for $500,-000 damages for alleged libel. The suit is based on an editorial published Dec. 31, in which the promoters of the Northwestern Elevated are referred to as "bandits" and the whole enterprise is claimed to be a scheme to defraud those who may invest in the securities of this road.

Keeley.

Keeley (the motor man, not the cure man) had a bad quarter of an hour the other evening at the Engineers' Club in Philadelphia. He suffered, however, by proxy, being discreet enough to stay at home himself. Mr. E. A. Scott read a paper on the Keeley motor in which he maintained that the best investigators had concluded that Keeley had discovered no new force and that many of the things done by him could be readily done by well-known laws and methods; in other words, that he is, as every sensible man knows he is, a humbug. His counsel, Mr. Collier, one of the stockholders of the company, Mr. Thomas and also Mr. Barnett Le Van spoke in behalf of Keeley and his so called motor, but of course all they had to say was mere assertion, as has been everything that Keeley and his advocates have said for the last 21 years. The only surprising thing about this episode is that so dignified a club should waste an evening in this way; but we suppose it took the place of a "smoker." Everyone must have a little relaxation.

Cleaning the 155th Street Viaduct, New York.

A number of weeks ago the Comptroller of the city of New York pitched into the method employed by Mr. E. P. North, Consulting Engineer to the Department of Public Works, in cleaning the great viaduct at 155th street by means of a sand blast and compressed air. Mr. North addressed a letter to a number of engineers, asking opinions as to the judiciousness of the method which he had adopted, and these opinions he has collected and printed in a pamphlet. Mr. Griener, Engineer of Bridges of the Baltimore & Ohio, says that the blast cleans the iron most effectively, and he knows of no more effective method. Mr. Waterhouse, Chief Engineer of the Manhattan, thinks the method employed wise and judicious. Mr. Wurzburger, Assistant Street Commissioner of St. Louis, says that it is the best method he has seen to thoroughly clean iron work and he is figuring on the use of it in that city. Mr. Brown, Chief Engineer of the Delaware & Hudson, says that it would be difficult to improve on the results obtained. Even where the surface is badly pitted the sand blast thoroughly removes all rust. Mr. Buck knows of no other process by which the work could be done so thoroughly, and he believes the method judicious. Mr. Horace Andrews, City Engineer of Albany, writes at considerable length. He anticipates that the results of the experiments will be highly successful and no more costly than must be expected in a pioneer enterprise. Mr. Moore, Engineer of Bridges of the New York, New Haven & Hartford, has seen no method which compares with this in effectiveness. Mr. Dawley, Division Engineer of the New York, New Haven & Hartford, was favorably impressed with the thoroughness of the work far beyond any usual method. Mr. Bissell, Chief Engineer of the Boston & Maine, sees but two objections to cost and possible destruction of material by the process, but while costly the work is so thoroughly done that the process probably pays. He has not been able to determine how serious is the reduction of area. He hopes to give the process a thorough trial. A number of letters from other engineers are published in the pamphlet, but the quotations which we have given are sufficient to indicate their opinions.

The Harbor Works at Savannah.

The Board of Engineers appointed to examine the river and harbor work at Savannah, and which is to make a report to the court martial appointed to try Capt. O. M. Carter, is now proceeding with its examinations. The following engineers comprise the Board: George Y. Wisner, Alexander E. Kastl, and H. C. Ripley.

A Note From Olympus.

The era of railroad construction has passed; the future railroads will be from the main through lines to growing towns. To-day we have re-entered the canal era. Although we look with pride to our magnificent system of railways, greater and more permanent flows the paths of our rivers, made by the Almighty through our nation to be utilized by us. They are the princely heritage of nature and should be considered of great value to us as a go-ahead people. To us these proud moving bodies which run into Puget Sound and the Columbia River should be yoked and by aided locomotion take our commerce to the Pacific Ocean without transferring enormous amounts for railway dividends to the East. Our representatives in Congress should use their strongest influence in pressing legislative memorial No. 22, session 1895, for such a survey so that the counties interested might place the matter before private parties who would undertake such a valuable waterway.—*The Olympia Olympian.*

How the Belgians Win in China.

Consul Morris, of Ghent, transmits the following translation of an article: Last May, a Belgian syndicate, supported by the French ambassador, succeeded in obtaining the concession of a railroad line running from Pekin to Hankow, along the Yang-tse-Kiang—one of the finest enterprises for which China offers the opportunity. Furthermore the Belgian syndicate obtained special conditions, which, according to statements of the English, are equivalent to the monopoly of railroad construction in central China. The representatives of England, Germany and the United States vehemently protested and opposed a new syndicate to the Belgian organization. This stroke was effective. There was hesitation at Pekin, and as the arrival of the Russian mission of Prince Oukhtomsky was expected, it was decided to await the presence of this ambassador before deciding the question. Prince Oukhtomsky sustained the Belgians, and an imperial decree soon afterward sanctioned the project of this syndicate. Some conditions were changed which limited its future prospects, but this concession did not disarm the English, the Germans and the Americans. They continued their offers, Li-Hung-Chang, like a true Chinaman, having taken care that a door should always be left open to the rival syndicates. We do not know exactly the situation of affairs. The final confirmation is still wanting, it seems, to the Belgian syndicate; but as Russia and France are placing all possible obstructions in the way of the construction of an English or German line, it is probable that the victory will fall to the Belgians. On the other hand, the English have not failed to win some advantage from their tenacity, for a British syndicate is on the point of obtaining the concession of a line uniting Hang-Chan-su-Chan and Shanghai by the valley of the Yang-tse-Kiang.

Train Collectors.

The Rock Island road has discontinued the practice of running collectors on passenger trains. About one year ago several conductors were discharged for dishonesty, and it was thought advisable to place collectors on all principal passenger trains. The services of the collectors have gradually been dispensed with since that time, until at the present time no collectors are running on Rock Island trains.—*Topeka Capital.*

LOCOMOTIVE BUILDING.

The Baldwin Locomotive Works are building one locomotive for the Winifrede Railroad.

The Pittsburgh Locomotive & Car Works have received an order for four locomotives from the Hoshiu Railway of Japan.

The Pittsburgh Locomotive & Car Works are building two more locomotives for the Union Railway, a branch of the Pittsburgh, Bessemer & Lake Erie.

The International & Great Northern has not placed an order for six locomotives with the Baldwin Locomotive Works, as stated by a contemporary last week.

The Erie Railroad has placed an order with the Rogers Locomotive Co., of Paterson, N. J., for 15 Wooten boilers to replace old boilers in that number of consolidation locomotives.

The Keokuk & Western is considering the purchase of three new locomotives, but we are informed by the Vice-President and General Manager that no order has yet been placed, nor has any decision as to type of engine been made.

The Baldwin Locomotive Works are building five Atlantic type passenger locomotives for the Wabash Railroad, not Columbia type, as stated by a contemporary last week. The works are also building five freight locomotives for the same road, as previously stated.

The report published last week by a contemporary that the St. Louis & San Francisco is in the market for locomotives is without foundation. The President of the road informs us that it is not intended to buy any new locomotives at present, as the road has all it needs. However, some may be bought later in the year.

The Dickson Locomotive Works, Scranton, Pa., have sold one mogul locomotive from stock to the Richmond, Petersburg & Carolina Railroad, and two of the same type to the Buffalo, Rochester & Pittsburgh. The engines have 18 × 24-in. cylinders, 56-in. driving wheels, and weigh about 105,000 lbs., with 90,000 lbs. on the drivers.

The International & Great Northern has placed an order with the Rogers Locomotive Works of Paterson, N. J., for 15 locomotives. They will have 19 × 24 in. cylinders, 56-in. drivers and weigh in working order 126,000 lbs., with 100,000 lbs. on the drivers. The boilers will be wagon-top, with 247 tubes, 2 in. in diameter and 12 ft. 6 in. long; firebox, 96 in. long and 42 in. wide. Otis steel will be used for boilers and fireboxes and the engines will be equipped with Westinghouse brakes, Houston track sanding devices and steel-tired truck-wheels.

The Baldwin Locomotive Works and the Schenectady Locomotive Works are building a number of engines for the Grand Trunk Railway on a somewhat novel plan. The specifications have been prepared in the office of the Superintendent of Motive Power of that railroad with a view to selecting the best in the practice of the leading builders of the United States, and with a view further to having no fads, but to using known and tried devices alone. Therefore many things that are now specified on locomotives are left out, and particularly the make of material has been specified in no instance.

The Baldwin Locomotive Works have received an order to build two Vauclain compound locomotives for the Barranquilla Railway & Pier Co., of Colombia, S. A. One will be for freight service and have 9½ and 16 × 18-in. cylinders, 42-in. driving wheels and weigh in working order about 52,000 lbs., with about 43,000 lbs. on the driving wheels and with eight-wheel tender of 2,000 gals. capacity. The other will be a passenger locomotive with 7 and 12 × 16-in. cylinders, 42-in. driving wheels and weigh in working order about 29,000 lbs., with about 22,000 on the driving wheels, and with an eight-wheel tender of 1,200 gals. capacity.

The five locomotives ordered by the Long Island Rail road from the Brooks Locomotive Works, referred to last week, will have 67-in. driving wheels and weigh in working order 105,000 lbs., with about 70,000 lbs. on the drivers; driving wheel base, 7 ft. 6 in.; total wheel base, 22 ft.; engine truck wheels, 30 in. in diameter; tender truck wheels, 33 in. in diameter; boiler, radial stay wagon-top type, outside diameter of first ring 56 in., with 225 tubes 2 in. in diameter; firebox, 11 ft. long and 42 in. wide; boiler shell to be of Carbon, Carnegie or Shoenberger & Co.'s steel; firebox, Shoenberger extra Juniata firebox steel; Taylor steel tires will be used on the engine and tender truck wheels and Latrobe steel tires on the driving wheels, which will have cast-steel centers. All axles, crank pins and piston rods will be of Coffin toughened steel. The engines will be equipped with Sellers' 1887 class N (improved) No. 9½ injectors, Sherburne track sanders, Gollmar bell ringers, chime whistles, Detroit triple sight feed lubricators, Foster reducing valves for steam heat and Westinghouse driver, engine truck, tender and train brakes. The capacity of the tender tank will be 4,000 gals. The original specifications called for 18 × 24-in. cylinders, but these dimensions were afterward changed by instructions to the builders to use a compound system.

The Richmond Locomotive & Machine Works will build ten 10 wheel compound and five simple engines for the Wabash Railroad. The former will have 20½ and 32½ × 26-in. cylinders and the simple engines 19 × 26 in. cylinders. The following dimensions apply to both classes: Driving wheels, 63 in., ou side diam.; driving wheel base, 14 ft., total wheel base, 24 ft. 5¾ in.; weight on drivers in working order 108,000 lbs.; total weight, 137,000 lbs.; boiler, radial stayed extended wagon-top type, diameter of boiler shell, inside, 61 in.; diameter of wagon top, inside, 69⅛ in.; firebox, 101⅛ in. long and 42¼ in. wide and 74⅝ in. deep at front and 64⅛ in. at back end; water space, 3½ in. sides, 4 in. front and back; thickness of firebox sheets, crown, sides and backs ⅜ in., tube sheets ⅝ in.; staybolts, 1 in. diam., charcoal bloom; number of tubes, 294, 2 in. in diam. (outside) and 14 ft. 3 in. long; firebox heating surface, 172.4 sq. ft., tube heating surface, 2,178.4 sq. ft., total heating surface, 2,350.8 sq. ft.; grate area, 29.77 sq. ft.; boiler pressure, 200 lbs.; boiler lagging, magnesia sectional covering; steam-chest valve, Wabash balanced; valve travel, 6 in.; outside lap, 1⅛ in.; inside lap, none; pistons, cast steel; piston-rods, steel, 3½ in. diam.; piston packing, snap ring, cast iron; piston-rod and valve stem packing, Wabash standard metallic; driving axle journals, 8×10 in.; driving-box lining material, Damascus bronze, babbitted; trucks, four-wheeled, rig'd center, with 30-in. double plate, chilled cast iron wheels. All the boiler and firebox steel will be furnished by the Otis Steel Co., and the specifications call for staybolts of Tennessee bloom iron; tubes, Pacific brand, made by the National Tube Works; water tubes in firebox, Franklinite brand, made by the same company; smoke consumer, Barnes; injectors, No. 10, Monitor; springs, Scott; sanding devices, Leach; bellringer and safety-valves, Wabash; brakebeams, Marden; couplers, Gould; and Westinghouse-American driver and engine-truck brakes and Westinghouse tender brakes. The engines will be used for freight service and the date of delivery has not yet been determined.

CAR BUILDING.

The Seaboard Air Line will build 400 freight cars at the Portsmouth shops.

The St. Charles Car Co. is building one passenger car for the Centralia & Chester.

The Allison Manufacturing Co. is building three cars for the Pennsylvania Salt Manufacturing Co.

The Southern Pacific has placed an order with the Wells & French Co. for 100 of their standard ballast cars.

The St. Charles Refrigerator Despatch has placed an order with the Wells & French Co. for 13 refrigerator cars.

The Pittsburgh & Lake Erie is reported in the market for 1,000 cars, but we were unable to verify the rumor at the time of going to press.

The Beech Creek Railroad has placed orders for 250 coal cars with the Union Car Co., 250 with Jackson & Woodin and 500 with the Michigan-Peninsular Car Co.

The Mobile & Ohio has placed an order for 300 coal cars with the Terre Haute Car & Mfg. Co., and for 300 box cars with the Ensign Mfg. Co., of Huntington, W. Va., to be delivered by June 1.

The Atlantic, Valdosta & Western has placed an order with the Ohio Falls Car Mfg. Co. for 50 flat and 10 box cars. They will be equipped with Westinghouse air-brakes and M. C. B. couplers.

We understand that Albert Schreiderwind, who is now in New York City, has come to the United States to buy a large number of steam and street railroad cars for the Argentine government railroads.

It is reported that the order of the Hammond Refrigerator Line for 50 refrigerator cars, of which mention was made in these columns some time ago, was placed with the Michigan-Peninsular Car Co.

The Atchison, Topeka & Santa Fe has recently put in service between Chicago and Kansas City some new postal cars which were built at the Topeka shops of the road. These cars are 60 ft. long, lighted with Pintsch gas and supplied with all modern improvements for convenience in handling mail en route.

The order for ore cars, for which the Duluth & Iron Range was recently in the market, has not been placed. It is reported two of the car companies that bid on the cars have been forced to decline the order on account of the large number of orders ahead already on their books, and that the road will build at its own shops one car per day.

The Illinois Central has ordered from the Rodger Ballast Car Co 100 of its "Standard" ballast cars (hoppers) and two "Standard" distributing cars. These cars are to be of 80,000 lbs. capacity, with elevated sides giving a capacity for 30 cu. yds. of ballast. They are to be equipped with air-brakes and automatic couplers and steel truck and body bolsters, and will be delivered March 10.

The Jackson & Sharp Co., of Wilmington, Del., has built a new car for Henry M. Flagler, President of the Florida East Coast Railroad. The car is 71 ft. 6 in. long over the body, and 78 ft. 8 in. over platforms. The interior is finished in white mahogany and satin wood, and is divided into the customary state rooms and apartments. Light is furnished from Pintsch gas, and all the chandeliers are of cut glass. The windows are of rolled plate, and the upper sashes and deck plate are of leaded glass.

The Norfolk & Western has placed an order for 300 of the 500 drop-bottom gondola cars referred to in our issue of Dec. 31 with the Ensign Mfg. Co., of Huntington, W. Va. We understand that Tower couplers will be used in addition to the equipments mentioned Dec. 31.

In our last issue we referred to the Lake Shore & Michigan Southern being in the market for some box and coal cars. Bids are being asked on 500 drop-bottom coal cars, known as removable end gate flush drop-bottom coal cars. They will be of 60,000 lbs. capacity, 34 ft. long over end sills, with sides high enough so that the box with average heaping will carry 66,000 lbs. of coal. The specifications call for L. S. & M. S. standard diamond truck with McCord oil boxes and lids of M. C. B. dimensions, simplex bolsters, Gould couplers, Westinghouse air-brakes and National hollow brakebeams. It is possible that 100 or 200 of the cars will be equipped with Gould spring buffers, and that 100 of them may have American steel bolsters, although these two last features have not been fully decided upon. The cars will also have Gould malleable draft rigging in place of oak draft timbers, these having proved a very economical substitute and improvement. The cars will also be equipped with Lappin brakeshoes, these being the standard of the Lake Shore & Michigan Southern at present on air brake cars. Steel axles will be used. Delivery is called for February and March, but it is doubtful if axles can be obtained early enough for any deliveries in the former month.

The Brooklyn City & Newtown (now controlled by the Brooklyn & Coney Island Railroad) has placed an order with the J. G. Brill Co., of Philadelphia, for 75 open cars.

The Greensburg, Jeannette & Pittsburgh Street Railway Co., Greensburg, Pa., will be in the market for four open and two closed cars in the spring. Bids will be asked about April 1.

BRIDGE BUILDING.

Chicago, Ill.—At a meeting of the Board of Trustees of the Sanitary District, Chicago, Jan. 5, contracts were awarded the Carnegie Steel Co. for the superstructures of the two Atchison, Topeka & Santa Fe swing bridges, one near Twenty-sixth street and one near Summit; the amounts bid were $44,243 and $51,040 respectively, as was noted in our issue of Dec. 31. The highway bridge over the canal at the crossing of the Lyons & Summit road was awarded to the Massillon Bridge Co., whose bid was $3,500. The contracts for the large eight-track bridge have not as yet been placed.

Cincinnati, O.—The County (Hamilton) Commissioners have been petitioned by residents of Mill Creek Valley to build a bridge across Mill Creek at the Springfield pike.

Denver, Col.—The Board of Public Works, it is reported, has authorized its engineer to prepare plans and specifications for the Fourteenth street viaduct. D. W. Campbell, Engineer.

Fair Haven, Md.—The contract for building an iron bridge was awarded by the Board of County Commissioners to the Groton Bridge & Mfg. Co., Groton, N. Y. Price, $1,075.

La Crosse, Wis.—The contract for building an iron bridge of two 60-ft. spans across Colman's Slough between the north side and French Island has been awarded to the Clinton Bridge & Iron Co. Price, $2,369.

Livingston, Mont.—It is reported that bids are asked for by the city for a bridge across Rock Creek.

Manassas, Va.—The Horseheads Bridge Co., of Horseheads, N. Y., will furnish the iron for the bridge at Kelly's Ford. This bridge is 408 ft. long, and plans for the same were made by John R. Tillett, of Manassas.

Marshalltown, Ia.—It is reported that a bridge will be built by the city over the tracks of the Great Western & Ohio Central at Center street.

New York.—The Board of Estimate and Apportionment has appropriated $150,000 for a new highway bridge connecting Woodlawn Station with the Williamsbridge Heights across the Bronx.

Omaha, Neb.—Bids are asked until Jan. 20 for building two highway bridges in Kountze Park, one to have 40-ft. spans and a width of 50 ft. A. P. Tukey, President Board of Park Commissioners.

Pittsburgh, Pa.—The Director Department of Public Works, Edward M. Bigelow, in his annual report, asks for $620,000 for rebuilding bridges.

Port Washington (L. I.), N. Y.—The contracts for the building of a street viaduct, four steel highway bridges and two spans on the extension of the Great Neck & Port Washington have been awarded to the Carnegie Steel Co.

Riverdale, Utah.—The Board of County Commissioners, it is reported, has had plans prepared for a new bridge to be built at Riverdale.

Shreveport, La.—The Shreveport Bridge & Terminal Co., capital stock $50,000, has been organized to build a bridge across Red River, at or near Shreveport. T. Alexander, President; J. L. Fletcher, Secretary; W. C. Vance, A. Curry and T. C. Barret, Directors.

Toronto, Ont.—An iron bridge will be built over the Humber River. It is also proposed to rebuild the bridge over the Don River at Eastern avenue. Edward H. Keating, City Engineer.

Ventura, Cal.—The contract for the Santa Clara River bridge (see *Railroad Gazette* Dec. 31, 1897) was awarded to the California Bridge & Construction Co., of San Francisco, Cal. Following is a statement of bids received: Quantities: 2,800 ft. of levee work with timber bulkhead; 620 ft. of timber trestle with sheet piling bulkheads; 985 ft. of 12 spans of combination steel and timber truss with 13 pile piers of 10 piles to each pier; 31,680 sq. ft. of asphalt pavement, 1 in. thick on plank;

Healy Tibbetts & Co., S. F., $31,183; Cal. Bridge & Const. Co., S. F., $31,369; San Francisco Bridge Co., S. F., $33,836, D. P. H. Little, L. A., $36,745; Thomson Bridge Co., S. F., $37,000; Darby Leydon & Co., S. F., $38,700; Saw & Arthur, L. A., $39,500; J. D. Morcerau, L. A., excepting levee work, $31,902; A. B Hogan, Pasadena, levee work only, $11,450; French & Reed, L. A., levee work only, $12,200; estimates made in August, 1897, $35,000; values have advanced about $3,000.

The Southern Pacific Railroad Co. is now building a trestle bridge 3,000 ft. in length, with 1,000 ft. of earth embankment, a few hundred feet below the above-mentioned Santa Clara River bridge, driving 60-ft. piles through the sand bed of the river, boring from 18 ft. to 34 ft. in depth.

Washington, D. C.—The engineers asked to submit plans for a bridge over Rock Creek, on the line of Connecticut avenue, have filed their drawings and estimates with the Engineer Commissioner of the District of Columbia, Captain Black, U. S. A. As reported in the *Railroad Gazette*, Dec. 17, the engineers competing are Mr. George S. Morison, Mr. William H. Breithaupt and Mr. L. L. Buck. The bridge will probably be 1,200 ft. or more in length, according to the design selected, and about 120 ft. high. An appropriation of $1,500 was made for the designs, $600 for the first prize, $500 for the second, and $400 for the third. Mr. Morison's design is for a granite viaduct. Mr. Breithaupt submitted two designs; one a combination viaduct of Melan construction, except the center span which is open steel work; the other a viaduct with steel arch spans and flanking stone arches. Mr. Buck also submitted two designs; one for Melan arches, faced with stone, and the other showing three steel arches with flanking arches of masonry. The estimates as to cost vary from $1,089,000 for Mr. Morison's proposed granite structure, to $437,748 for a sandstone bridge.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Burlington, Cedar Rapids & Northern, semi-annual, 2 per cent., payable Feb. 1.

Northern Central, semi-annual, 4 per cent., payable Jan. 15.

Central Railroad of N. J., 1 per cent., payable Jan. 14.

Stockholders' Meetings.

Indiana, Illinois & Iowa, annual election of Directors, Chicago, Jan. 19.

Fort Wayne & Jackson, annual election of Directors, Jackson, Mich., Jan 25.

The Engineers' Club of Philadelphia.

The nineteenth annual meeting of the Club will be held on Saturday, Jan. 15, 1898, at 8 o'clock p. m. Mr. Joseph T. Richards, the retiring President, will deliver the annual address.

Engineers' Club of St. Louis.

The meeting of January 5 was called to order at 8 p. m, President Bryan in the chair; 29 members and 6 visitors present.

The paper of the evening, by Mr. Richard McCulloch, was read. It was entitled "An Historical Sketch of Street Railways." The development of the street railway from the first road in New York City in 1832 was traced. The early experiments, with mechanical traction and the history of the pioneer roads, was given. The general improvements in street railway construction was traced down to the present time. The local history of the St. Louis roads was then taken up. A short sketch of the omnibus lines, which preceded the street railways, was given, and the history of the early horse railways was outlined. The first cable roads and the early electric roads were described, and the paper closed with a review of the present condition of the street railways.

The discussion was participated in by Messrs. Sturgeon, Eayres, Perkins, Harrington, Ockerson, Hermann and Johnson.

Central Railway Club.

The next meeting, to be held at the Hotel Iroquois, Buffalo, N. Y., on Friday, January 21, will be the annual meeting and entertainment of the Club, at which time officers will be elected for the ensuing year.

The business session will be preceded in the morning by a Car Wheel Test, which has been arranged for the Club by President P. H. Griffin, of the New York Car Wheel Works.

The committee appointed in November to co-operate with Mr. Griffin consists of A. C. Robson, Chairman; J. A. Bradley and John Magarvey. A special car will leave the corner of Main and Niagara streets, at 9 a. m., for the Car Wheel Works, and returning will leave the works at 1 p. m.

The business session will be held at 2 p. m. in the Iroquois parlor, the docket being as follows:

Report of the Executive Committee and Annual Report of the Secretary-Treasurer.

"Springs for Freight Car Tracks" (Committee to Suggest Standard Coils). Committee: H. C. McCarty, H. F. Ball, J. R. Petrie.

"The Advantages of Improved Tools in Railroad Shops." Committee: S. Higgins, Chairman; H. C. McCarty, James Macbeth, John S. Lentz, Allan Vail.

Invitation of President Griffin, of the New York Car Wheel Works: A. C. Robson, J. A. Bradley, John Magarvey.

Annual entertainment: F. B. Griffith, O. P. Letchworth, C. E. Rood, E. A. Benson, H. H. Hewitt.

Nominations: E. Chamberlain, A. C. Robson, H. C. McCarty, P. E. Garrison, J. A. Bradley.

Discussion.—"Journal Bearing Keys; their proper relation to the Journal Bearing and Box." Committee: H. F. Ball.

Topical question submitted by J. R. Petrie: "In receiving cars loaded, can they be refused by the receiving company when they are 34½ in. from the top of the rail."

The annual entertainment this year will consist of a "Smoker," and the features usually given in connection with a social event of that character. It will be held at the Hotel Iroquois at 8 o'clock in the evening. Members and their railroad friends are invited.

Civil Engineers' Society of St. Paul.

The fifteenth annual meeting of the Civil Engineers' Society of St. Paul was held at 8:30 p. m., Jan. 3, 1896; present 19 members and 11 visitors, Vice-President Crosby in the chair. Art. III. of the constitution by final vote was amended to read as follows:

"Any civil, electrical, mining or military engineer, and any architect, metallurgist, assayer or surveyor, holding an appropriate degree conferred by any incorporated college or university, or any graduate of the United States Military or Naval Academies, who shall have practiced his profession for one year or longer, or who, not holding such degree, shall have practiced his profession for five years or longer, shall be eligible to membership in this Society. Persons chosen from the classes mentioned in this article shall be called members.

"Students of engineering and other persons who intend to adopt one or more of the branches of the profession that are mentioned in the last preceding paragraph, but who are ineligible for full membership, may be chosen as juniors. They shall have all the privileges of members accept the right to vote.

"Associate members may be chosen from among persons whose interest in pure science, or in the applications of science, may lead them to desire connection with the Society. They shall have all the privilege of members except the right to vote.

"Honorary members may be chosen. They shall be men eminent in science, or men who have conferred some signal benefit on this Society. They shall be free from all fees and assessments."

The reports of the Secretary, Treasurer and Librarian were read and accepted. Officers were elected for the ensuing year as follows: *President*, J. D. Estabrook; *Vice President*, Oliver Crosby; *Secretary*, C. L. Annan; *Treasurer*, A. O. Powell; *Librarian*, A. W. Munster; *Representative on Board of Managers of the Association of Engineering Societies*, E. E. Woodman. At 10 o'clock the meeting adjourned to the banquet room and the last toast was responded to in the early morning.

The Western Society of Engineers.

The 19th annual meeting and banquet of the Western Society of Engineers was held at the Technical Club of Chicago the evening of Jan. 4.

The result of the annual election of officers was:

President, Alfred Noble; *First Vice-President*, J. J. Reynolds; *Second Vice-President*, A. V. Powell; *Treasurer*, C. W. Melcher; *Trustee*, G. P. Nichols.

About 75 members and guests attended the banquet, Mr. Isham Randolph acting as toastmaster. Mr. Alfred Noble, Chairman of the Membership Committee, reported 52 new members during the year as against a loss by resignations and deaths of 38 members, making the total membership of the Society at the close of the year 425. Mr. Emil Gerber presented the reports of the Treasurer and of the Finance Committee, which showed a flourishing condition of the Society.

Especial attention was called by Mr. Liljuncrantz to the advantages which the John Crerar Library will offer to the engineers of Chicago, as a very considerable portion of the income of that richly endowed library is to be devoted to engineering and other technical literature.

Mr. J. J. Reynolds presented the report of the Committee on Publication, in which it was stated that owing to the great willingness displayed by members to present valuable papers to the Society it had been necessary to include 138 pages of matter in each issue of the *Journal* instead of 96 pages, as originally proposed. The Committee felt certain that when the outstanding accounts were all in it would show that the *Journal* had notonly paid for itself, but would have a small amount to its credit besides.

The presentation of the reports of the committees was followed by the address of the retiring President, Mr. Thos. T. Johnson, who after commenting upon the prosperous condition of the Society and the success attending upon the publications of the *Journal*, turned the attention of the members present to the wonderful achievements and opportunities for the engineering profession in waterways. He spoke briefly of the Chicago Sanitary District Canal. Referring to the Manchester Canal, England, he stated that instead of that enterprise being a financial failure, it had already resulted in increasing the value of property along its line, especially at Manchester, far beyond the actual cost of the canal itself. Reference was also made to the fact that one of the members of the Society, Mr. J. S. Metcalf, was at present engaged in erecting a monster grain elevator in Manchester, England, alongside of the canal. The work of the United States Deep Waterway Commission, of which Mr. Alfred Noble, the incoming President, is a member, was referred to. To Mr. L. E. Cooley, Mem. W. S. of E., was largely due the active promotion of this project of connecting the great lakes with the seaboard by a ship canal. In the speaker's opinion the increase of ship building upon the shores of Lake Erie, should this canal be opened, would alone fully offset the entire cost of the project. Finally the Nicaragua Canal was brought to the attention of the Society, because of the fact that several of its members had just sailed from New York to Nicaragua to investigate the feasibility of building the canal as a purely business enterprise. This party included members of such well-known contracting firms as Mason, Hoge & Co., E. B. Smith & Co. Winston Bros., McArthur Bros., and Washburn & Washburn. Mr. L. E. Cooley headed the party, and he was referred to as "the man who had built one canal, if ever one man built a canal, had started another, if ever one man started a canal, and was now sent to point a way to finish the Nicaragua Canal."

The inaugural address of the incoming President, Mr. Alfred Noble, was listened to with the greatest interest. Mr. Noble said in part:

"Among the so-called local engineering societies of the United States we were, at the beginning of 1897, third in point of numbers, the Boston Society of Civil Engineers, with 431 members, and the Engineers' Club of Philadelphia, with 413, exceeding our 411. The Engineers' Society of Western Pennsylvania, with a membership of 401, followed closely. In respect to revenue we ranked second or third, if we eliminate receipts on account of the *Journal*, and we now rank first if we include them. Of the three societies mentioned, two publish their own transactions; the largest one publishes its transactions in the *Journal* of the Association. The position of our Society among the so-called local societies may therefore be summed up briefly: We are nearly the first in point of numbers, probably the first as to resources and, we fully believe, the first as regards the *Journal*.

"The engineering profession is, in this country, notoriously lacking in *esprit de corps;* largely on account of this it has failed to conquer a satisfactorily professional standing. It is through such organizations as ours that this pride in the profession must be developed; we must seek to draw in all worthy and capable engineers, and we must as carefully exclude the unworthy.

"Although classed as a local Society, we are much more than that. The word Western which appears in our corporate name embraces in this country a large part of its area and a larger part of its ambition and vigor. Of the territory designated as 'the West,' the larger portion is strongly allied by material interests with this city as its metropolis. These conditions point to a future for this Society as a sectional one rather than a local one."

In the after-dinner speech made by Judge Carter, of the Cook County Court, the most effective part was the eloquent rehearsal of Mr. H. G. Prout's description in *McClure's Magazine* of "A Modern Miracle," being an account of the way a great disaster was prevented by the British engineers in India.

Other speakers were Mr. C. W. Andrews, Librarian of the John Crerar Library; Mr. L. B. Moorehouse, the one Honorary Member of the W. S. of E.; Mr. R. W. Hunt and Mr. Ralph Modjeski.

American Society of Civil Engineers.

The 45th annual meeting will be called to order in the Auditorium of the House of the Society, 220 West Fifty-seventh street, at 10 o'clock a. m. Jan. 19. The annual reports will be read, officers elected and general business transacted. Lunch will be served at 1.30, after which, if necessary, the meeting will be resumed. During the afternoon there will be a meeting of the Board of Direction. The committee has arranged for several short excursions to objects of interest on that afternoon, viz.:

To Jerome Park Reservoir.—Through the courtesy of A. Fteley, M. Am. Soc. C. E., Chief Engineer, Aqueduct Commission, members are invited to visit this work. Alfred Craven, M. Am. Soc. C. E., Division Engineer in charge of the work, will conduct the party.

The Jerome Park reservoir is intended to increase the capacity of the distributing reservoir system of the Croton Water Works. It is to add nearly 2,000,000,000 gals. to the present capacity of the Central Park distributing reservoirs, which, being only 1,000,000,000 gals., is now too small compared with the daily present consumption of 225,000,000 gals.; moreover, this consumption is shortly to be increased by the opening of the pipe system which has just been laid, mostly in Fifth avenue, for the direct and improved supply of the lower portion of New York.

The Jerome Park reservoir requires a very large excavation, about 7,000,000 cu. yds., half rock and half earth. The depth of water will be 25 ft. The estimated cost of the reservoir is $5,700,000. The land taken by the city for the reservoir and approaches covers 300 acres and costs $3,000,000. The structure is to be formed by a continuous embankment containing a core wall of rubble stone masonry. At the northwest corner, where the ground is the lowest, the embankment is 40 ft. high, and the core wall is built into the ground to a maximum depth of 40 ft. The slopes of the embankments are to be covered with concrete and brickwork for the lowest part, and with concrete and dry-stone masonry for the upper portion. The bottom is to be covered with concrete made with Portland cement. Parts of the embankments are under construction; the highest being now completed. The work of excavation is now going on at various points, the motive power being mostly furnished from a central station with air compressors. Ten locomotives and 120 standard gage platform cars are in use; from 2,500 to 3,000 cu. yds. of rock and earth are being excavated every day, and the output is soon to be increased.

High Buildings.—Reginald Pelham Bolton, Assoc. M. Inst. C. E., will take charge of a party which will visit the Bowling Green Building, which is the largest, although not the loftiest, building in New York City, and contains the latest examples of improvements in such buildings, as in hydraulics: the double pressure system of hydraulic elevators; the multiple pressure system of fire and house water service; the Adams hydraulic sewage lift. In electricity: the large storage battery of the Edison Electric Manufacturing Company; the vertical system of wiring buildings; lead-covered conductors in plain steel pipe conduits: new system of elevator calls and signaling. In steam: the Webster system of vacuum steam heating; open feed heaters. In refrigeration: ice water production and circulation.

Columbia University.—Members of the Society have been invited by William H. Burr, M. Am. Soc. C. E., Professor of Civil Engineering, Columbia University, to visit the new buildings. Professor Burr will be in charge of this party.

Assembly.—At 9 p. m. an Assembly will be held at the Society House. There will be dancing, and supper will be served during the evening.

Harbor Excursion.—Thursday will be devoted to an excursion by steamer to points of interest in and about New York Harbor.

The items of interest which will be seen on this trip are: At the yard of the Department of Docks, West Fifty-seventh Street, the making of the concrete blocks for the bulkhead wall; the construction of the bulkhead wall at the Gansevoort Street Section; piers under construction; the 100-ton floating derrick which handles 65-ton concrete blocks, etc. George S. Greene, Jr. M. Am. Soc. C. E., Engineer-in-Chief, and A. McC. Parker, M. Am. Soc. C. E., First Assistant Engineer, will be with the party and point out the matters of interest.

Off the Battery the fire-boat New Yorker will give an exhibition. The steel fire-boat New Yorker was built in 1890. The principal dimensions are: Length over all 125 ft. 6 in, beam 26 ft., draft 11 ft. 6 in., displacement 470 tons; a triple expansion engine, cylinders of 15, 24 and 39 ins. diameter and 24-in. stroke; maximum steam pressure, 148 lbs. and the working pressure 125 lbs. per square inch.

The steamer will then proceed up the East River, pasing under the Brooklyn Bridge, and will make a stop at the Brooklyn Navy Yard. It is probable that at this time the cruiser Brooklyn and the battle-ship Texas will be at the yard and open to inspection. Other interesting features are: The work now in progress at the entrance of Dry Dock No. 3 and in the said dock; the causeway now building to connect the cob dock with the mainland, with its tidal gates to permit the flow of water from the Navy Yard side into the city side of the Wallabout, etc., etc.

The new East River Bridge, the site of which will be passed, is to extend from Delancey street, New York, to Broadway, Brooklyn, running to the surface in the former city at Clinton street, and in the latter city at Rodney street. The plans for the work were adopted in the summer of 1896. L. L. Buck, M. Am. Soc. C. E., is the chief engineer.

The length of the channel span is to be 1,600 ft. from center to center of towers. The distance between the anchorages is to be 2,780 ft. The total length of the bridge is to be 7,200 ft. There are to be four cables, each about 18 in. in diameter and two suspended trusses each 40 ft. high and spaced 67 ft. center to center. The width of the bridge is to be 118 ft. There are to be two steam railroad tracks, four trolley tracks, and two roadways outside of the trusses, each 18 ft. wide. The steel towers are to be 315 ft. high, resting on masonry piers rising 20 ft. above the high-water line, making a total height of towers above high water 335 ft. The steel towers will rest on caissons each about 60 × 70 ft. in plan, and placed 97.5 ft. apart, center to center. The north caisson on the New York side was launched on May 15, 1897, and has been sunk to rock at a depth of about 55 ft. below high-water line. This foundation is secured and the masonry is being completed. The south caisson on the New York side was launched on Sept. 30, 1897. It will reach a depth of about 65 ft. below high water. The south caisson on the Brooklyn side was launched on Oct. 19, 1897, and will be 39 ft. high. It will be sunk to the rock at a depth of about 86 ft. below high water. The north caisson on the Brooklyn side was launched on Dec. 15, 1897. It will be 53 ft. high, and will be sunk to a depth of about 100 ft. below high water.

Address.—At 8.30 p. m. Mr. Russell Sturges will address the Society on the "New Relations between Engineering and Architecture." The address will be illustrated with lantern slides. After this lecture there will be a "smoker." The committee consists of Messrs. E. E. Olcott, S. L. F. Deyo, W. E. Belknap, A. S. Tuttle and Charles Warren Hunt.

PERSONAL.

—Mr. C. E. Stanton, heretofore Auditor of the Utah Central, with headquarters at Salt Lake City, Utah, has resigned.

—Mr. F. B. Shafer, heretofore General Freight and Passenger Agent of the Utah Central, with headquarters at Salt Lake City, Utah, has resigned.

—Mr. H. S. Parks, heretofore Treasurer of the West Virginia Northern at Kingwood, W. Va., has resigned to become Manager of the Kingwood National Bank.

—Hon. Martin A. Knapp has been elected Chairman of the Interstate Commerce Commission in place of Hon. William R. Morrison, whose term as Commissioner has expired.

—Mr. Edward A. Ferguson, who has been for the last 25 years Foreman of the Boston & Maine repair shops in Portsmouth, N. H., died at that place Jan. 6 of heart disease; aged 60 years.

—Mr. T. C. Sherwood, heretofore General Manager of the Kansas City & Northern Connecting, with headquarters in Kansas City, Mo., resigned on Jan. 5 to engage in other business.

—Mr. W. K. Morley, who has been Division Superintendent and Superintendent of Telegraph of the Kansas City, Pittsburgh & Gulf, has resigned. His headquarters were formerly at Shreveport, Ind.

—Mr. Charles W. McMeekin, heretofore Chief Engineer of the Iowa Central at Marshaltown, Ia., has resigned his position to accept a similar position with the Anaconda Mining Co., Anaconda, Mont.

—Mr. George Engle, heretofore Assistant Chief, Civil and Mining Engineer of the Lehigh Valley Coal & Mining Co., at Langsford, Pa., has resigned to accept a similar position with the Delaware & Hudson Coal Co., at Scranton, Pa.

—Mr. J. H. MacAdoo, heretofore District Freight Agent of the Great Northern, with headquarters at Pittsburgh, Pa., has resigned his position to accept the position of General Freight Agent of the American Glass Co. at Pittsburgh.

—Mr. James D. Welsh, heretofore General Agent for the Freight Department of the Union Pacific, with headquarters in Cincinnati, O., has resigned. Mr. Welsh has been with the Union Pacific as General Freight Agent for more than 25 years.

—Major T. J. Anderson, formerly Assistant General Passenger Agent of the Chicago, Rock Island & Pacific, with headquarters at Topeka, Kan., and recently transferred to the office of local Freight Agent at Topeka, has resigned. Resignation took effect Jan. 1.

—Mr. John E. Dolman has resigned his position as Assistant Attorney for the Chicago, Rock Island & Pacific, with headquarters at Topeka, Kan., and has formed a partnership with Judge Stephen S. Brown, of St. Joseph, Mo., in the general practice of law. Resignation took effect Jan 1.

—Mr. Edward D. Harlow, for many years Auditor of the Boston, Concord & Montreal, now the Boston & Maine, and also Treasurer of the Maverick Wharf Co., of Boston, died in his home in Salem, Mass., Jan. 7, at the age of 63. He was at one time Treasurer of the Mount Washington, now part of the Boston & Maine.

—At a meeting of the Directors of the Pacific Express Co., held in Omaha, Neb., Jan. 6, Mr. William Bechel, Auditor, and Mr. T. K. Sudburrough, Assistant Auditor, resigned, and Mr. Erastus Young, Auditor of the Pacific, was elected to succeed Mr. Bechel. Superintendent and Treasurer Morseman resigned his office of Treasurer and A. M. Taylor, of St. Louis, Mo., was elected to that office.

—Sir Charles Hutton Gregory, known as an Engineer, and former President of the Institution of Civil Engineers, died in London, Jan. 10, at the age of 81.

Mr. Gregory has been Directing or Consulting Engineer of many important works, among them the construction of railways in Ceylon, Trinidad, at the Cape of Good Hope, and in the States of Perak and Selangor. In 1882 he was a member of the Channel Tunnel Committee, and four years later was one of the Royal Commissioners of the Colonial and Indian Exhibition in London.

ELECTIONS AND APPOINTMENTS.

Atchison, Topeka & Santa Fe.—The office of Division Engineer, which was abolished four years ago, has been re-established. J. M. Meade, heretofore Resident Engineer at Pueblo, Col., has been appointed to the new office. His headquarters will be at Pueblo, Col. Appointment took effect Jan. 1.

Blue Ridge Dispatch.—Don Alexander, heretofore Assistant General Freight Agent of the Chesapeake & Ohio at Louisville, Ky., has been appointed General Manager of the Blue Ridge Dispatch, succeeding Geo. F. Costa. His office will be at Harrisburg, Pa.

Boston & Lowell.—At the annual meeting of the Directors, held in Boston, Mass., Jan. 5, William Powell Mason was elected a Director, succeeding George A. Gardiner.

Chesapeake & Ohio.—F. T. Walker has been appointed General Agent at Louisville, Ky. Appointment took effect Jan. 1.

Chicago, Rock Island & Pacific.—H. S. Ray has been appointed Traveling Passenger Agent at Pittsburgh, Pa., succeeding E. E. McLeod.

Cincinnati, Hamilton & Dayton.—D. S. Wagstaff, General Northern Agent, with headquarters at Detroit, Mich., has been transferred to Toledo, O., as Northern Passenger Agent.

Coahuila & Zacatecas.—The officers of this Mexican road, now under construction, referred to in another column, are as follows: President and Treasurer, William Purcell; Vice President, Jasper F. Lynch; Secretary and Superintendent, A. W. Lilliendahl. The central office is at Saltillo, Mex.

Colorado, Sandusky & Hocking.—E. L. McCune, heretofore in charge of the Maintenance of Way Department, has been appointed Real Estate Agent, with headquarters at Columbus, O.

Cooperstown & Charlotte Valley.—At the annual meeting of the stockholders recently held at Cooperstown, N. Y., H. L. Cooper was elected a Director, succeeding Fred. Remstle.

Danville & Shanokin.—At the annual meeting of this company, which is a part of the Philadelphia & Reading, held in Philadelphia, Jan. 10, the following officers and Directors were elected: President, J. S. Harris; Treasurer, W. A. Church; Secretary, W. R. Taylor. Directors: George F. Baer, Theodore Voorhees, C. E. Henderson, D. Jones, B. H. Bail, and W. G. Brown.

Delaware River Ferry Co. of New Jersey.—At the annual meeting of this campany, which is a part of the Philadelphia & Reading, held in Philadelphia, Jan. 10, the following officers and directors were elected: President, J. S. Harris; Vice President, Theo. Voorhees; Treasurer, W. A. Church; Secretary, W. R. Taylor. Directors: J. S. Harris, Thomas McKean, Theodore Voorhees, C. E. Henderson, D. Jones, J. D. Landis and H. C. Felton.

East Mahanoy.—At the annual meeting of this company, which is a part of the Philadelphia & Reading, held in Philadelphia Jan. 10, J. S. Harris was elected President, succeeding Edward C. Knight. W. A. Church was elected Treasurer and W. R. Taylor Secretary, succeeding John S. Wise, heretofore Treasurer and Secretary.

Erie.—J. H. Klein, heretofore Trainmaster of the Lake Erie and Western, at Lima, O., has been appointed Trainmaster of the Eastern Division of the Chicago & Lake Erie.

Fair Hill Railway.—At the annual meeting, held in Philadelphia, Jan. 10, the following Directors were elected: J. W. Crawford, W. J. Latta, W. A Patton, M. H. Shortridge, J. B. Stauffer and George Wood.

Florida Central & Peninsula.—W. H. Pleasants, General Freight Agent at Jacksonville, and A. O. MacDonnell, General Passenger Agent at Jacksonville, hereafter will have charge of the freight traffic and passenger traffic respectively, succeeding N. S. Pennington, heretofore Traffic Manager, resigned. (See these columns for Dec. 31.)

Grand Trunk.—James H. Muir, Treasurer of the lines west of the Detroit and St. Clair Rivers, has had his office moved from Detroit, Mich., to Montreal, Que.

W. J. Hunter has been appointed General Traveling Freight Agent with headquarters at Detroit, Mich., succeeding Wm. Robinson, resigned.

Illinois Central.—C. A. Beck, heretofore Assistant Second Vice-President, has been appointed General Purchasing Agent, with office at Chicago, Ill. He has been succeeded by John F. Wallace, as noted in our issue of last week. Mr. Wallace as Assistant Second Vice-President will have general charge of Maintenance of Way and Structures, and will also make investigations from time to time under the direction of the Second Vice-President as to the practicability of effecting economies in the service, and will perform such other duties as may be assigned to him by the Second Vice-President or the President. The Chief Engineer and Consulting Engineer will report to him. David Sloan, heretofore Acting Chief Engineer, with office at Chicago, has been appointed Chief Engineer, with headquarters at the same place. These appointments are also effective on the Yazoo & Mississippi Valley. Appointments took effect Jan. 1.

The title of A. J. MacDonnell has been changed from Eastern Passenger Agent to Assistant General Agent. His headquarters are at New York City.

Intercolonial.—N. Weatherstone, heretofore Western Freight and Passenger Agent, with headquarters at Toronto, Ont., has been appointed Traveling Freight Agent, with headquarters at Montreal, Que.

Iowa Central.—The position of Chief Engineer, heretofore occupied by Charles W. McMeekin, at Marshaltown, Ia., has been abolished and the duties hereafter will be performed by Superintendent C. W. Huntington, with office at Marshaltown.

Kaighn's Port & Philadelphia Ferry Co.—At the annual meeting of this company, which is a part of the Philadelphia & Reading, held in Philadelphia Jan. 10, the following officers and Directors were elected: President, J. S. Harris; Treasurer, W. A. Church; Secretary, W. R. Taylor. Directors, J. S. Harris, Thomas McKean, Theodore Voorhees, C. E. Henderson, D. Jones, Jas. M. Landis and H. C. Felton.

Kansas City & Northern Connecting.—Robert Gillhan has been appointed General Manager, with headquarters at Kansas City, Mo., succeeding T. C. Sherwood, resigned.

Kansas City, Pittsburgh & Gulf—F. Mertsheimer, who was recently appointed General Superintendent of the Kansas City, Pittsburgh & Gulf, has been appointed General Superintendent of the Kansas City & Northern Connecting, which is a part of the Kansas City, Pittsburgh & Gulf. He will perform the duties of both offices hereafter.

H. S. Wiggins has been appointed Auditor and Treasurer. Rush H. Bonds has been appointed General Freight and Passenger Agent. J. H. Parker has been appointed Master Mechanic and Superintendent of Motive Power; Allen P. Smith has been appointed Claim and Fuel Agent, all on the Texarkana & Fort Smith. The headquarters of all will be at Texarkana, Tex. Appointments took effect Dec. 15.

Long Island.—A. B. Bierck, heretofore Acting Auditor, has been appointed Auditor, with headquarters at Long Island City.

L. B. Pairo has been appointed Superintendent of Transportation in charge of train and car service. The office of Assistant Train Master has been abolished.

Louisville, Evansville & St. Louis.—Elliott Holbrook, Superintendent, with headquarters at Princeton, Ind., will, in addition to his present duties, assume charge of the engineering, bridge and building departments, with title of Superintendent and Chief Engineer, with office at same place. (See these columns for Dec. 24.) William Flannelly has been appointed Traveling Passenger Agent for the territory west of the Mississippi River, with headquarters at St. Louis, Mo. Appointment took effect Dec. 22. B. F. Mitchell has been appointed Commercial Agent, with headquarters at Evansville, Ind., succeeding Edward Sample.

Miami River & Belt.—The officers of this company, referred to in another column, were elected on Dec. 30 as follows: President, H. T. Mathers, Sidney, O.; First Vice-President, A. T. Wells, Chicago, Ill.; Second Vice-President, T. H. Thedieck; Secretary, Frank Hunter; Treasurer, Charles Timeus, of Sidney, O.; General Manager, S. H. Bracey, Chicago; Chief Engineer, John S. McNair, 704 Owings Bldg., Chicago, Ill.

Michigan Central.—W. C. Rowley, heretofore Commercial Agent at Detroit, Mich., has been appointed Assistant General Freight Agent, with headquarters at Bay City, Mich., succeeding E. E. Gerkens, deceased. C. C. Griggs has been appointed Commercial Agent at Detroit, Mich., succeeding Mr. Rowley.

Mississippi River & Bonne Terre.—Gust. Setz has been elected Treasurer and Purchasing Agent, with headquarters at Bonne Terre, Mo., succeeding C. H. Meyer.

Missouri, Kansas & Texas.—A. D. Arbegast, General Foreman of Bridges and Buildings, has had his office moved from Denison to Dallas, Tex.

Monongahela Connecting.—At the annual meeting of the Directors, held at Pittsburgh, Pa., Jan. 10, B. F. Jones, Jr., was elected Assistant Treasurer. His headquarters will be at Pittsburgh.

Montgomery, Haynesville & Camden.—At the annual meeting of the stockholders, held Jan. 4, at Montgomery, Ala., the following were elected Directors: Sol. D. Bloch, E. B. Joseph, F. M. Billing, H. C. Tompkins, S. Roman, Jacob Griel and W. F. Vandiver. At a meeting of the Directors, held later, the following officers were elected: Hon. H. C. Tompkins, President; W. F. Vandiver, Vice-President; Sol. D. Bloch, heretofore President, was elected General Manager and Secretary; Ex-Gov. Thomas G. Jones, Attorney, and John P. Kohn, Treasurer.

Moss Point & Pascagoula.—At the annual meeting held a Moss Point, Miss., Jan. 1, the following officers and Directors were elected: J. W. Stewart, President; O. Randall, Vice-President; C. H. Wood, Secretary-Treasurer. Directors, A. S. Denny, M. M. Watkins, H. N. Dantzler, Jr., Dr. I. K. McLeod; A. P. Cassils, Manager.

Nashville, Chattanooga & St. Louis.—J. H. Mittler has been appointed Northwest Passenger Agent, with headquarters at St. Louis, Mo. Frank Siever has been appointed Florida Passenger Agent, with headquarters at Jacksonville, Fla. These appointments took effect Jan. 1. The office of R. C. Cowardin, Western Passenger Agent, has been removed from St. Louis to Dallas, Tex.

Norristown Junction.—At the annual meeting of this company, which is a part of the Philadelphia & Reading, held in Philadelphia Jan. 10, W. A. Church was elected Treasurer and W. R. Taylor Secretary, succeeding Howard Boyd, heretofore Treasurer and Secretary.

Omaha, Kansas City & Eastern.—The following appointments and changes were made Dec. 1: Robert Gillhan has been appointed General Manager and Chief Engineer, with headquarters at Kansas City, Mo.; John M. Sevin, heretofore General Manager, has been made Assistant General Manager and General Superintendent, with headquarters at Quincy, Ill.; John A. Sargent has been appointed General Freight Agent, with headquarters at Kansas City; R. W. Blakesley has been appointed Assistant General Freight Agent, with headquarters at Quincy, Ill.; H. C. Orr has been appointed General Passenger Agent, with headquarters at Kansas City; W. W. Avery has been appointed Assistant General Passenger Agent, with office at Kansas City; John M. Voorhis has been appointed Division Master Mechanic, with office at Quincy, Ill.; E. M. Collins has been made Assistant Chief Engineer at Trenton, Mo.; C. E. Soule has been made Superintendent, with headquarters at Quincy; W. N. Allen has been appointed Stationer, with office at Kansas City, and H. J. Dutton has been appointed General Passenger Agent, with office at Kansas City.

Pennsylvania Co.—Samuel Hardin Church has been appointed Assistant Secretary of the Pittsburgh, Cincinnati & St. Louis, a part of the Pennsylvania Co., with headquarters at Pittsburgh, Pa.

Perkiomen Railroad.—At the annual meeting of this company, which is a part of the Philadelphia & Reading, held in Philadelphia Jan. 10, Howard Boyd was elected a Director.

Pickering Valley.—At the annual meeting of this company, which is a part of the Philadelphia & Reading, held in Philadelphia Jan. 10, J. S. Harris was elected President, succeeding James Boyd, of Philadelphia.

Pine Bluff & Arkansas River.—The officers of this newly organized company, referred to in another column, were elected at Pine Bluff, Ark., Jan. 6, as follows: President, John M. Gracie; Vice-President, J. M. Taylor; Secretary, W. H. Langford. These men, with H. E. Martin, constitute the Board of Directors.

St. Louis Southwestern.—The headquarters of J. J. Kress, Superintendent of Car Service, H. D. Kelley, Chief Engineer, and G. C. Montaigue, Superintendent of Telegraph, which have been heretofore at Texarkana, have been transferred to Tyler, Tex. The change was made on Jan. 1.

Sierra Railway of California.—W. G. Potts has been appointed Superintendent, with headquarters at Oakdale, Cal., succeeding E. T. Albert.

Stockbridge & Pittsfield.—W. A. Seymour has been chosen to fill the vacancy existing in the Board of Directors caused by the death of Wm. J. Bartlett.

Tennessee Northern.—The new officers of this company are as follows: Harvey M. La Follette, Vice-President; F. W. Rodgers, General Freight and Passenger Agent; J. K. Sroufe, Superintendent. The headquarters of all are at La Follette, Cal.

Terminal Market Co.—At the annual meeting of this company, which is a part of the Philadelphia & Reading, held in Philadelphia Jan. 10, the following officers and Directors were elected: President, James M. Landis; Treasurer, Richard Tull; Secretary, W. R. Taylor. Directors: James M. Landis, J. H. Loomis, W. R. Taylor, W. G. Brown, Roswell Weston.

Velasco Terminal.—W. W. Anderson has been appointed General Passenger Agent, with headquarters at Velasco, Tex.

Wabash.—A. H. Lander, heretofore Master of Transportation of the Midland Division, having been assigned to other duties, the office has been abolished and reports hereafter will be sent to the Superintendent. The office of Car Service Agent has been abolished and that of Superintendent of Transportation has been created. Charles B. Adams, heretofore Car Service Agent, has been appointed to that office, with headquarters at St. Louis, Mo. Changes and appointments took effect Jan. 1.

West Virginia Northern.—F. C. Todd, of Kingwood, W. Va., has been made Treasurer, succeeding H. S. Parks, resigned. His office will be in Kingwood.

RAILROAD CONSTRUCTION,
Incorporations, Surveys, Etc.

Alaska Railroads.—It is announced by A. C. Bratnober, of Tacoma, Wash., that the plans of Henry Bratnober, his brother, for a railroad into the Yukon country over the Dalton trail have been approved by the Rothschilds of London. The road is projected to run from Pyramid Harbor on Chilkoot Inlet, north across Chilkoot Pass to Fort Sulkirk on the Yukon, about 400 miles, connecting at that point with steamers for Dawson City. It is said that surveys are being made, and that the work of building will begin in the spring. The cost for building and equipping is estimated at $8,000,000, and it is hoped to have the entire line in operation early in 1899. On account of the snow, the road will not be operated in the winter, but the promoters think that the summer business will be sufficient to pay for building and operating the road.

Brainerd & Northern Minnesota.—It is reported that A. Guthrie & Co., of St. Paul, Minn., obtained a contract for building the proposed extension from the present northern terminus at Walker, Minn., northwest about 30 miles to a connection with the Great Northern. The road is used largely for logging purposes. (See this column for May 21, 1897.)

Bruton & Pineora.—It is officially stated that no work has been done on this road during the past year, but that it is expected to begin operations in the near future. The track was graded and rails laid some years ago, but it has never been operated. The new charter was given last March, and it was originally proposed to build the road from Macon, Ga., to Savannah, 100 miles, of which 28 miles from Bruton to Stillmore has been completed. A. F. Daley, of Wrightsville, Ga., is President. (See this column for Nov. 15.)

Buffalo, Rochester & Pittsburgh.—This company is reported to have nearly completed the cut-off in the 5.5 miles on the Pittsburgh division from Lanes Mills, Pa., to Falls Creek. This will take the place of 9.02 miles of the present main track, shortening the line by 3.52 miles.

California Eastern.—It is reported that Roger W. Woodbury, of Denver, Col., President of this road, has made arrangements in the East for the extension of this road from its present terminus at Manvel, Cal., to Goode Springs, Nev., 50 miles. The present road extends from Manvel to Blake, 30 miles.

Carthage.—It is officially stated that the entire extension has been completed from Carthage to Hallison, N. C., 8½ miles, and that regular train service will begin Jan. 17. W. C. Petty, of Carthage, N. C., is General Manager. (See this column for Dec. 3.)

Chesapeake Beach.—It is officially stated that about 10 miles of this road from Washington, D. C., east to Chesapeake Beach has been graded, of which two miles is in operation between Deanwood and the District line. An engine and two cars are on the tracks and rails and switches are delivered. The rest of the work is progressing in a satisfactory way. L. H. Hyer, of Washington, D. C., is Chief Engineer of the Chesapeake Bay Construction Co., which is building the road. (See this column for Nov. 12.)

Chicago & Northwestern.—This company is putting into repair the western portion of the Pence branch, between seven and eight miles in length, extending a little south of west of Kerley, Wis., to Osborn, which portion has not been operated for several years. The territory adjacent is timber country, and the company states that a large amount of logs will be shipped from that section during the present winter.

Chihuahua & Pacific.—It is stated that final surveys are nearly complete for this road to be built from Chihuahua, Mex., to Topolobampo on the Pacific Coast, and that the work of grading and track laying will begin at an early day. Almeric Hugh Paget, of New York City, is President.

Chilkoot Railroad & Transport Co.—It is officially stated that this company has completed the steam railroad from Dyea to Cañon City, Alaska, eight miles, and is now building the aerial cableway, seven miles long, from Cañon City over Chilkoot Pass to Crater Lake, which will be completed during the present month. This road has been fully described under Alaska Roads in this column for Oct. 15 and Dec. 19 and 24. The company contemplates building a railroad from Crater Lake to Lindeman, another on the left bank of the Yukon River around White Horse Rapids, and is considering the advisability of building a third around Five Finger Rapids. All these lines will be needed to make quick connection from Crater Lake to the Yukon.

Coahuila & Zacatecas.—It is officially stated that all the grading has been completed and about one-half the rails laid on this narrow gage road from Saltillo, State of Coahuila, Mex., southwest to Concepcion del Oro, about 85 miles. It is expected that the entire road will be completed in April. The officers are given in another column. (See this column for Oct. 8.)

Columbus Junction Terminal & Belt.—This company has been incorporated in Ohio, with a capital stock of $1,000 to build a belt line around the City of Columbia. The incorporators are Albert E. Boone, the promoter of the Black Diamond System; Jacob A. Stout, Jesse Weirick, H. A. Axling and E. G. Slough.

Golden Circle.—It is stated that this company has filed a mortgage for $400,000 on its property in favor of the Mercantile Trust Company, of New York, for the purpose of extending its road beyond Victor, Col. The road now under construction extends from Goldfield to Victor, about 3 miles, of which one-half mile had been completed at the end of the year. Dumphy & Wilcox, of Victor, Col., has the contract for this portion of the road. W. F. Jones, of Denver, Col., is Auditor. (See this column for March 26, 1897.)

Great Northern.—The new Park Rapids & Leech Lake branch from Park Rapids, Minnesota, northeast 18.32 miles to Akeley via Dorset and Nevis was opened for traffic Jan. 3.

Idaho Northern.—This company has been incorporated in Idaho with a capital stock of $12,000,000, to build a line from Butte, Mont., southwest to Nampa, Ida., and another from Nampa to Spokane, Wash., in all about 700 miles. W. H. Dewey is President. Principal office Nampa, Ida.

Indiana Stone.—This company was incorporated in Indiana Jan. 3, with a capital stock of $15,000 to build a line from Clear Creek, Monroe Co., to Harrisburg. It is stated that this road is to be built in the interest of the Cincinnati, Indianapolis & Louisville, which company will furnish the equipment. The incorporators are: Samuel Thomas, of New York; W. H. DeDoel, of Chicago, Ill., and other directors of the Cincinnati, Indianapolis & Louisville.

Kansas & Southeastern.—This company has filed an amended plan of the proposed route from Hunnewell, Kan., southwest to Kay Center, Okla. A Board of Appraisers has been appointed to condemn the right of way. It is said that grading will begin in a few days and the company expects to have 25 miles completed within 90 days. Surveying will be continued from Kay Center through Guthrie to South McAlester, Ind. T. (See this column for Nov. 5.)

Kansas City, Osceola & Southern.—It is stated that contracts are still to be let for the big 40 ft. cut 8 miles north of Bolivar, Mo., on the extension from Osceola, Mo., southeast 40 miles to Bolivar. George S. Good & Co., of Lock Haven, Pa., has the general contract. (See this column for Dec. 10 and 31.)

Las Vegas, Mora & Taos.—This company was incorporated in New Mexico, Jan. 5, with a capital stock of $1,700,000, to build a line from Las Vegas, N. Mex., through the Mora grant, about 85 miles. The incorporators are: Edward B. Wheeler, East Milton, Mass.; Richard Dunn, Gaston Mills, N. Mex.; Francisco Manzanares, John Hill and Robert M. Ross, of Las Vegas.

Lehigh Valley.—It is officially stated that about 1⅓ miles of grading has been completed and .2 mile of track laid and ballasted on the Seneca County extension from Geneva Junction east to Seneca Falls, eight miles. (See this column for Nov. 12.)

Luckiamute Valley & Western.—It is officially stated that about three miles of the proposed line from Falls City, Ore., to Salem, 23 miles, has been graded and ready for ties, and the ties for about five miles of the distance have been secured. The company has obtained all the right of way to Salem, and expects no trouble in an extension from that point to the coast. The company is in need of capital to develop the resources of that region, which abounds in timber, granite, coal and iron, besides fine fruit and wheat farms. H. S. Montgomery, of Falls City, Ore., is President. (See this column for Dec. 3.)

Mexican Northern.—It is reported that work is to begin at once on the proposed extension of this road from Sierra Mojado, Mex., north about 200 miles through the Boquillas mining camp to Marathon, Tex., a point on the Southern Pacific. The surveys were made for the extension some time ago. The present line runs from Escalon, a point on the Mexican Central, east 81.5 miles to Sierra Mojado. (See this column for Feb. 19, 1897.)

Mexican Southeastern.—It is stated that the Mexican Government has declared forfeited the concession made to this company for non-compliance with the terms made under the grant. The route as projected is from San Geronimo southeast along the Pacific coast about 425 km. (264 miles), with a branch from Tonala northeast to Chiapas River 213 km. (131 miles). (For map and full description of this road see this column for Dec. 24.)

Miami River & Belt.—It is officially stated that this company, whose incorporation was noted in this column last week, proposes to build a railroad from Minster, Auglise County, O., through Shelby County via Sidney to Lake View, Logan County, a distance of 40 miles. The branch line of the Lake Erie & Western from Minster to St. Mary's, has been leased, and arrangements have been made with the new Columbus & Northwestern for running passenger trains over the road from St. Mary's to Lake View via Wapakoneta, making a complete circuit of 80 miles. Other lines connected by the belt will be the Cleveland, Cincinnati & St. Louis, the Cincinnati, Hamilton & Dayton and the Ohio Southern. Surveys were to be begun last week. For officers see another column.

Milwaukee & Superior.—It is officially stated that grading has been completed from Sussex, Wis., west to within 10 miles of North Lake, and track has been laid between Sussex and the ice houses west of North Lake. Ballasting is completed between Sussex and Merton, five miles, and regular trains are running between these points. H. A. Boedker & Co., of Chicago, is to do the heavy steam shovel work, and there is about 50,000 cu. yds. yet to be removed. Winfield Scott, of Milwaukee, Wis., is President, and William Powrie, of Waukesha, Wis., is Chief Engineer. (See this column for Oct. 29.)

Missouri, Oklahoma & Texas.—This company has been incorporated in Oklahoma, with a capital stock of $800,000, to build a line from Henrietta, Tex., a point on the Missouri, Kansas & Texas, northeast through Oklahoma and Indian territories to a point on the Kansas line east of Chetopa, about 290 miles. The directors are: S. Clay, A. F. Foster, E. B. Mundy, D. S. McDonough, all of Tecumseh, Okla. T.

Norfolk & Western.—It is officially stated that grading has been completed for 1¼ miles on the second track between Bluefield and Ada, W. Va., and track on this section will be completed within the week. The balance of the four miles of second track will be finished inside of three months. L. H. Vaughan & Co., of Roanoke, Va., holds the contract. (See this column for Dec. 3.)

Northern Minnesota & Wisconsin.—This company was incorporated in Minnesota Jan. 9, with a capital stock of $10,000, to build a line from Nickerson northwest in Pine County. The incorporators are Lester R. Brooks, Philips R. Brooks, Anson S. Brooks, M. Joseph Scanlon and Henry E. Gibson, of Minneapolis, and Dwight F. Brooks and Harry K. Brooks, of St. Paul.

Northern Pacific.—It is officially stated that 16 miles of grading has been completed on the Gaylord & Ruby Valley extension of the Butte Branch from Gaylord, Mont., about 25 miles to Twin Bridges, and that track has been laid from Renova Junction toward Twin Bridges, 10¼ miles. Work has been discontinued on account of the winter, but will be resumed as early in the spring as the weather permits. The contractors are Cook & Woldson, Helena, Mont. (See this column for Nov. 26.)

Portland, Vancouver & Yakima.—It is stated that a large force of men is engaged in making repairs on the road of this company, which was recently incorporated to succeed the Vancouver, Klickitat & Yakima. (See this column for Dec. 17). About two miles of the road has been completed and an extension made of the trestle along the river front at Vancouver, Wash. Expensive changes are to be made in the terminal at that city.

Pueblo & Southwestern.—This company was incorporated in Colorado Jan. 4 to build a line from Bessemer Junction, on the Denver & Rio Grande, a short distance south of Pueblo, southwest about 30 miles across the Mesa and through the cañon of the St. Charles River to Beulah. The incorporators are D. J. Kelly, Bernard A. Jaeger, of Denver, and J. E. Rizer, of Pueblo. It is understood that preliminary surveys have been made.

San Francisco & San Joaquin Valley.—It is stated that a contract will be let the first week in February for the 5,700 foot tunnel on the extension from Stockton, Cal., west to San Francisco. (See this column for Dec 10). W. B. Story, Jr., of 321 Market street, San Francisco, Cal., is Chief Engineer and General Superintendent.

Short Line.—Surveys are being completed for this line from Clarksburgh, W. Va., to New Martinsville, about 25 miles. Bennett & Son have closed a contract for part of the grading on the upper end of the line and work was begun last week. (See this column for Dec. 24.)

Stockton & Tuolumne County.—This company has been incorporated in California, with a capital stock of $1,000,000, to build a line from Stockton east about 35 miles to Summerville. The Directors are Robert S. Clark, Alameda, Cal.; Jabish Clement and Hannah Lewellyn Lane, of San Francisco, Cal.; Annie Klein Kikert, Jamestown, Cal.; Maggie Downing Brainard, San Jose, Cal.

Tennessee Northern.—It is reported that Callahan & Co., of Knoxville, Tenn., has received the contract for building 3½ miles of the extension of this road from La Follette southwest toward Careyville. J. K. Sroufe, of La Follette, Tenn., is Chief Engineer. (See this column for Oct. 29.)

West Virginia Southern.—This company has been incorporated in West Virginia with a capital stock of $50,000 to build a line from Brownstown, W. Va., south about 75 miles to Tazewell, Va. Among the incorporators are Joseph Renshaw and R. T. Herndon.

Yuma & Gulf of California.—This is to be the corporate name of the railroad in Arizona and Mexico, referred to in this column Dec. 17 under "Mexican Roads." Capt. Alfonzo B. Smith, of Los Angeles, Cal., has received a concession from the Mexican government to build this line from San Jorge, on the Gulf of California, along the head of the Gulf northwest 61 miles to the boundary, and 15 miles from the boundary up the Colorado River to Yuma, Ariz., total 76 miles. Surveys have been given from both ends of the route, and it is expected that contracts will be let as soon as the surveys are completed, about Feb. 20. Grades will be light, since Yuma is but 145 ft. above the sea level. There will be no iron or steel bridges, but 76 culverts will be needed, and two cuts will be made 18 ft. deep. Captain Smith has put into the road about $200,000 of his own capital, and wants to place bonds on the road, covering the railroad and half a million acres of land, which is suitable for mining and agriculture.

Electric Railroad Construction.

Allegheny, Pa.—The Board of Directors of the Mt. Troy & Reserve Township Traction Company met recently to make arrangements to put their line in operation. C. Beckert, President of the company, and William Eberhardt, Vice-President, was appointed to confer with James D. Callery, President of the United Traction Company, to secure power to operate the Reserve Township Branch. Arrangements will also be made for the leasing of several of that company's cars for the winter season at least. The Secretary was authorized to make the January assessment on all delinquent stockholders.

Amherst, Mass.—The Amherst & Sunderland Railway Co. has made application for a franchise in Hodley and expects to extend its lines.

Bangor, Me.—The Bangor, Orono & Oldtown Electric Railroad Co. is to build a new power plant.

Bay City, Mich.—The Bay City, Tuscola & Huron Railway Co., capital stock $100,000, proposes to build an electric railroad from Bay City and West Bay City to Sebewaing. The distance between the points is 30 miles. Directors, George H. Granger, Frank L. Wand, Leman L. Culver and Reuben C. Tasker, Bay City.

Blue Ridge Summit, Pa.—Blue Ridge Electric Railway Co., capital $50,000, is to build a line 3½ miles long at Blue Ridge Summit, Franklin County. The line will eventually be extended to Waynesboro. The Directors are: Roger W. Barrow, Baltimore, Md., President; Randolph Norwood, Blue Ridge Summit; Dr. I. N. Snively, Dr. A. H. Stickler, Waynesboro.

Bridgeton, N. J.—The City Council has voted to allow the Bridgeton & Millville Traction Co. to make extensions. The company will extend its tracks to the southern line of the city, and the plans call for further extensions in the direction of Fairton, Cedarville, Newport and Port Norris, but how soon the latter extensions will be carried out is at present uncertain.

Carnegie, Pa.—The Carnegie, Oakdale & McDonald Street Railway Co. has applied for a charter, capital $60,000. William J. Steen, Oakridge, Pa., is President. The directors are W. J. McCully, Thomas Cooper, H. C. Johnson, J. M. Borden and H. M. Barber. The road will run from Carnegie to the McDonald oilfields, 20 miles, and will be parallel to the Pittsburgh, Chartiers & Youghiougheny.

Clearwater, Fla.—It is reported that an electric road will be built in Clearwater. H. B. Plant, President of the Plant system, 12 West Twenty-third street, New York, is mentioned in connection with the enterprise. William Matchett, Clearwater, can probably give information.

Ellwood, Pa.—The Ellwood & New Castle Street Railway Co. has received a charter of incorporation, capital $80,000, to run from Ellwood City to New Castle, Lowrence County, through the towns of Wampum, Newport, Moravia and Mahoningtown.

Fitchburg, Mass.—We are authoritatively informed that the Fitchburg & Leominster Railway Co. will build two extensions consisting of lines connecting suburban property with its main line at central points. The entire length of track to be built is about six miles. The company will also make an addition to its power station 32 × 75 ft., and will install a 400 K. W. direct-connected generator to a slow-speed engine and will make the necessary increase in the capacity of the boiler plant. The company will also add to its equipment several open double-truck cars.

Fort Scott, Kan.—The Citizens Railway Co., capital stock $60,000, has been organized. Among the Directors are: W. B. Hurst, W. H. Frost, C. B. McDonald, D. P. Thomas, W. C. Perry.

Greensburg, Pa.—The Greensburg & Mt. Pleasant Street Railway Co. has issued a mortgage to the Union

Trust Co., of Philadelphia, for $200,000. The rights of way from both municipal, township and all abutting property owners in townships have all been secured, and the contracts will be let in April for the immediate completion of the work. The company is ready to receive bids on all kinds of supplies, and from contractors for either part or the entire amount of the work. The entire length of the line will be 11 miles when completed.

Hackensack, N. J.—The Bergen County Traction Co., now operating an electric line between Fort Lee and Englewood, will apply for a franchise through Hackensack in the spring and will continue the line through Englewood as soon as the courts give permission to cross the Erie Railroad tracks.

Hannibal, Mo.—The Hannibal, Palmyra, & New London Electric Ry., in which officials of the Hannibal & Suburban Traction Co. and the Hannibal Railway Co. are interested, has been organized, but has not as yet been incorporated. The building of it will depend upon the success with which its promoters meet in floating a bond issue in connection with the improvements and extensions of their present street railroad lines.

Indianapolis, Ind.—The Indianapolis, Anderson & Marion Electric Railway Co. contemplates an extension of its line to Muncie, Ind.

Kansas City, Kan.—The Kansas City, Forest Lake & Bonner Springs Railway Co. has been granted a charter to build an electric railroad between Bonner Springs and Kansas City, through Forest Lake.

Los Angeles, Cal.—Articles of incorporation were filed Dec. 30 by the Los Angeles-Pacific Railway Company. The company is formed for the purpose of consolidating the capital stock, debts, property, assets and franchises of the two corporations known as the Pasadena & Pacific Railway Company, of Arizona, and the Pasadena & Pacific Railway Company, of California, to build and operate railroad lines between Los Angeles and Santa Monica, with branch lines running to Hollywood, Laurel Canon, South Santa Monica, Santa Monica Canon and the Soldier's Home. It is also the purpose to build telegraph and telephone lines along the main road and branches. The estimated length of all of the roads is 100 miles There are 13 stockholders, each subscribing to five shares. The names are as follows: E. P. Clark, J. H. Spires, William D. Larrabee. Warren Gillelen, R. F. Jones, A. I. Smith, Milton E. Hammond, T. C. Paxton, M. H. Sherman, J. M. Copes, B. W. Pratt, W. C. Durgin and John D. Pope, all of whom are to act as directors for the first year. William M. Buffum, as Trustee, subscribes to 9,935 shares. The amount of capital stock is fixed at $1,000,000, $100,000 of which has been paid up, divided into shares of $100 each The main business offices will be located in Los Angeles. This system of electric roads is now in operation with the exception of one or two small feeders. The proposed consolidation of securities is for the purpose of unifying the management and to make possible further extensions and improvements.

Marinette, Wis.—The Marinette Street Railway Co. and the Menominee Street Railway Co., it is reported, are entertaining plans for using power which will be furnished by the recently organized Marinette & Menominee Electrical Co. This company, capital $200,000, has been organized to develop the water power at Chippy Rapids, Menominee, on the Menominee River. Among the incorporators are: Isaac Stephenson, Fred. Carney, Sr., A. C. Merriman, of Menominee: John Spalding, Chicago, and S. M. Stephenson, of Menominee, Mich.

New Rochelle, N. Y.—The Huguenot Electric Railway Co. has been incorporated to build an electric railroad in Westchester County; capital stock, $100,000. Directors: L. K. Fries, J. M. Schuyler. James A. Burchell and N. J. Burchell, New Rochelle; G. G. Duy, of New York City; A. B. Linderman, J. A. Cass and M. B. Faulkner, Philadelphia.

Northampton, Mass.—The Northampton Street Railway Co. will shortly commence the extension of its road.

Nyack, N. Y.—The Nyack Traction Co. has secured franchises to build in Nyack, Grand View, Congers, Rockland Lake, Clarkstown and Spartin and will commence to build their road in the spring.

Philadelphia, Pa.—The Chelton Avenue, and the Twenty second street & Allegheny Avenue Passenger Railway Companies have applied to the Council for permission to build extensions.

The Southwestern Street Railway Co. has been granted permission by the Council to lay tracks and poles for trolley lines in the Twenty-first, Twenty-sixth, Twenty-seventh and Thirtieth wards.

Quincy, Ill.—We are authoritatively informed concerning the proposed electric railroad from Quincy to points in Calhoun County, in which J. C. Hubinger, of Keokuk, Ill., is interested, that the plans for the enterprise are as yet in rather indefinite shape, but that the road will in all probability be built.

Trenton, N. J.—It is reported that a new traction company has been organized here, and will apply for a charter. The road will be known as the Burlington, Trenton & Keyport road. It is reported that Col. Edward D. Morrell, and State Senator Mitchell B. Parker are interested in the enterprise.

Victoria, B. C.—It is reported that a new road, the Mountain Tramway & Electric Co., has applied for a charter.

Washington, D. C.—The Washington & Glen Echo Railroad Co. is considering plans for extending their line from the Aqueduct Road to Cabin John Bridge.

The report on the various bills providing for the extension of the lines of the Metropolitan Railroad Co. has been completed by the Commissioners of the District. The object of the bill in question is to extend the lines of the Metropolitan to Columbia Heights and Holmead, on the east side of Fourteenth street, and to Mount Pleasant, Lanier Heights, and Engleside, on the west of Fourteenth street. The road does not state a definite time when it will be ready to make the various extensions planned, consequently the Commissioners do not recommend the giving of the franchises until a time limit of construction is set.

A bill is pending before the Committee of the District Columbia of the Senate and House to give the Capital Traction Co. the right to lay tracks along B street north and across the plaza of the Capitol.

White Plains, N. Y.—It is announced by Herbert T. Jennings, Treasurer of the New York, Elmsford & White Plains Railroad Co., that after Feb 1 the company will be known as the Tarrytown, White Plains & Mamaroneck Railroad Co. The line will be extended to Mamaroneck as soon as franchises and right of way can be obtained, and it is expected that cars will be in operation by July 1.

Worcester, Mass.—The Worcester Consolidated Street Railway Co., it is reported, contemplates an extension of its line to Grafton.

It is reported that the Southbridge & Sturbridge Street Railway Co., and the Warren, Brookfield & Spencer Street Railway Co., have perfected plans for connecting the two lines by building an electric railroad from Central square in Brookfield to a point near the Worcester South agricultural grounds in Sturbridge.

GENERAL RAILROAD NEWS.

Railroad Earnings.

[Showing the gross and net earnings for the periods ending at the dates named.]

October 31:

Philadelphia, Wilmington & Baltimore.					
12 months	Gross	$8,791,436	$9,047,131	D.	$255,695
12 "	Net	2,387,231	2,353,124	I.	34,107
November 30:		1897.	1896.	Inc. or	Dec.
Baltimore & Ohio Southwestern.					
1 month	Gross	$534,763	$495,620	I.	$39,143
1 "	Net	153,190	141,207	I.	11,983
5 months	Gross	2,882,535	2,624,732	I.	257,803
5 "	Net	931,931	837,005	I.	94,926
Chicago Terminal Transfer.					
5 months	Gross	$456,812	.....		.....
5 "	Net	308,878	.....		.....
Fitchburg.					
1 month	Gross	$624,940	$632,776	D.	$7,836
Illinois Central.					
1 month	Gross	$2,563,709	$1,869,566	I.	$694,143
1 "	Net	992,955	489,467	I.	503,488
5 months	Gross	11,509,057	9,312,727	I.	2,196,330
5 "	Net	3,597,918	2,642,694	I.	955,224
Kansas City, Fort Scott & Memphis.					
1 month	Gross	$466,157	$383,971	I.	$82,186
1 "	Net	128,916	123 012	I.	5 9 4
5 months	Gross	2,218,521	1,957,796	I.	260,725
5 "	Net	711,540	649,410	I.	62,130
Mexican National.*					
1 month	Gross	$494,622	$474,516	I.	$20,576
1 "	Net	236,019	239,820	D.	3,701
12 months	Gross	5,481,482	4,725,757	I.	755,725
12 "	Net	2,667,527	2,209,115	I.	458,402
* Mexican currency.					
Norfolk & Western.					
1 month	Gross	$909,956	$903,739	I.	$6,217
1 "	Net	277,726	243,076	I.	34 650
5 months	Gross	4,793,133	4,433,602	I.	359,531
5 "	Net	1,538,217	950,611	I.	587,606
Oregon Short Line.					
1 month	Gross	$548,317	$536,477	I.	$2,840
1 "	Net	228,945	238,761	D.	9,816
5 months	Gross	2,732,522	2,546,651	I.	185,871
5 "	Net	1,089,811	864,733	I.	225,078
Philadelphia & Erie.					
1 month	Gross	$496,164	$476,596	I.	$19,568
1 "	Net	153,771	162,644	D.	8,873
11 months	Net	1,271,189	1,215,007	I.	56,182
Rio Grande Western.					
1 month	Gross	$290,601	$216,291	I.	$74,310
1 "	Net	108,109	73,187	I.	34,922
5 months	Gross	1,529,783	1,091,307	I.	438,476
5 "	Net	597,864	370,735	I.	227,129
Union Pacific, Denver & Gulf.					
1 month	Gross	$358,279	$312,005	I.	$46,274
1 "	Net	147,833	125,463	I.	22,370
5 months	Gross	3,215,401	2,829,124	I.	386,277
5 "	Net	912,143	665,697	I.	246,446
December 31:					
Buffalo, Rochester & Pittsburgh.					
1 month	Gross	$289,079	$255,384	I.	$33,695
Chesapeake & Ohio.					
1 month	Gross	$1,110,653	$1,018 518	I.	$91 835
6 months	Gross	6,020,617	5,358,599	I.	662,088
Chicago, Great Western & St. Paul.					
1 month	Gross	$416,926	$379,952	I.	$236,974
12 months	Gross	5,101,934	4,651,021	I.	450,913
Cleveland, Cincinnati, Chicago & St. Louis.					
1 month	Gross	$1,319,816	.....	I.	$115,397
Columbus, Hocking Valley & Toledo.					
1 month	Gross	$262,621	$205,930	I.	$56,701
12 months	Gross	2,532,695	2.480,924	I.	52,690
Great Northern.					
1 month	Gross	$1,881,184	$1,577,390	I.	$303,794
6 months	Gross	12,988,090	11,657,115	I.	1,330,975
Lake Erie & Western.					
1 month	Gross	$314,174	$287.982	I.	$26,192
12 months	Gross	3,438,744	3,343,164	I.	95,579
Louisville & Nashville.					
1 month	Gross	$1,906,200	$1,854,971	I.	$51,229
6 months	Gross	11,054.737	10,592,913	I.	461,824
6 "	Net	3,760,162	5,531,253	I.	228,909
Missouri, Kansas & Texas.					
1 month	Gross	$1,184,358	$1,141,085	I.	$43,273
6 months	Gross	7,044,472	6,549,021	I.	495,451
Missouri Pacific.					
1 month	Gross	$2,450,000	$2,062,000	I.	$388.000
12 months	Gross	24,886,000	21,964,000	I.	2,922,000
New York Central & Hudson River.					
1 month	Gross	$3,674,592	$3,638,168	I.	$36,424
3 months	Gross	11,888,462	11,668,561	I.	219,898
6 "	Gross	24,302,274	22,938,464	I.	1,363,810
New York, Ontario & Western.					
1 month	Gross	296,146	$271,803	I.	$25.343
6 months	Gross	2,165,985	2,118,793	I.	47.192
St. Louis & San Francisco.					
1 month	Gross	$519,558	$475,392	I.	$44.166
6 months	Gross	2,853,882	2,694,090	I.	159,792
St. Louis Southwestern.					
1 month	Gross	$491,800	$526,500	D.	$34 700
6 months	Gross	2,853,882	2,694,090	I.	159,792
Southern.					
1 month	Gross	$1,795,345	$1,699,790	I.	$95,555
6 months	Gross	10,453,058	9,838,585	I.	614,473
Wabash.					
1 month	Gross	$1,075,895	$965,364	I.	$110,531
6 months	Gross	6,833,461	6,134,048	I.	699,413
Western New York & Pennsylvania.					
1 month	Gross	$274,200	$226,200	I.	$48,000
6 months	Gross	1,852,322	1,671,150	I.	181,172
Wisconsin Central.					
1 month	Gross	$372,159	$304,389	I.	$67.770
6 months	Gross	2,592,269	2,231,800	I.	358,469

Baltimore & Ohio Southwestern.—Ohio & Mississippi first consols, due Jan. 1, are being purchased by Brown Bros. & Co. at par. In accordance with the notice of some weeks ago, these certificates were withdrawn for redemption, and interest ceased on Jan. 1.

Bloomsburg & Sullivan.—The proposed plan of settlement with the bondholders without foreclosure has failed because of non-agreement of about three per cent. of the holders of the 15 per cent. of the loan. A new plan will be formulated at an early date by the bondholders' committee which represent over 70 per cent. of the bonds. The Fidelity & Safe Deposit Co., of Philadelphia, is depository, and Morton McMichael, of Philadelphia, Chairman of the committee. This road extends from Bloomsburg, Pa., to Jamison City, 30 miles. It has a capital stock of $600,000, and funded debt of $599,000.

Boston & Lowell.—On Jan. 5 the stockholders voted to issue $226,900 of the 4 per cent. two-year coupon bonds, dated Oct. 1, 1898, to refund an equal amount of Salem & Lowell bonds which become due on that date. The Worcester & Marlboro has been permitted by the Massachusetts Railroad Commissioners to issue $200,000 5 per cent. bonds to replace a like amount which became due Oct. 1.

Central Ohio.—William H. Conkling, Basil B. Gordon, Derick Fahnestock and John Black, who form the committee which has secently brought suit against the Baltimore & Ohio for a separate Receivership, have issued the circular to shareholders, inviting those who desire to join in the suit, to which reference was made in this column Dec. 31. The petition is to come before Judge Sage, of the United States Circuit Court, at Cincinnati about Jan. 15.

Chambersburg & Gettysburg.—This road has been leased by the Cumberland Valley, and possession was taken Jan. 1. The road runs from Wolf Hill, Pa., to Conococheague Junction, 10 miles. It is stated that for the present only occasional freight trains will be run over this road.

Chicago, Burlington & Quincy.—Sealed proposals will be received by D. R. Whitney, at 85 Devonshire street, Boston, for $78,819 of the four per cent. Denver bonds due Feb. 1, 1892, in accordance with the agreement of 1881. Interest on these bonds will cease Jan. 15.

Chicago, Peoria & St. Louis.—The company has made a proposal to the first mortgage bondholders that the payment of the coupons due Jan. 1 be extended six months with interest at 6 per cent. Bondholders are requested to deposit their coupons under this agreement with the Atlantic Trust Co., and the plan is to be operative only in case 85 per cent. of the interests affected agree before Feb. 1. This proposition is made "pending the formulation of comprehensive plans for adjustment" of the company's indebtedness. The company states that upon its organization in 1896 it was placed under a burden of $800,000 floating debt, which, with interest, now amounts to $888,000, secured principally by $2,110,000 of the first mortgage bonds. There are in addition two car trusts to be maintained by payment of nearly $600,000 per month, and various claims amounting to about $50,000 in excess of the provision then made.

Cincinnati, Hamilton & Dayton.—Attorney-General Monnett, at Columbus, O., has instituted *quo warranto* proceedings in the Supreme Court against this company to vacate state canal lands which it has been occupying at Dayton and Hamilton.

Cincinnati Southern.—Bills are being drafted to be presented to the Ohio Legislature, one calling for the sale of this road and another for its perpetual lease. The terms of the lease will be for a yearly rental of $1,000,000 and a part of the gross receipts. This road was built by the city of Cincinnati, being completed in 1880 at a total cost of $18,491,964. It is leased to the Cincinnati, New Orleans & Texas Pacific, which forms a part of the Queens & Crescent. The road extends from Cincinnati to Chattanooga, Tenn., 325.92 miles.

Columbus, Hocking Valley & Toledo.—The $300,000 Receivers' certificates which were authorized in 1897, have been issued by Receiver Monsarratt to pay February interest and to purchase new cars. (See this column for July 30.)

Duluth, Missabe & Northern.—Sealed proposals will be received by the Central Trust Co., of New York, for the sale of first consolidated mortgage bonds Jan. 1, 1893, not to exceed $67,924 at a rate not above 105 per cent. and accrued interest.

Hartwell.—Judge Newman, at Atlanta, Ga., has issued a decree ordering the sale of this road to satisfy a mortgage given by the company in 1880 for $20,000. The road extends from Hartwell, Ga., to Bowersville, 10 miles.

Interoceanic of Mexico.—According to the annual report of the earnings of the company for the year ended June 30 were as follows (Mexican currency):

Year:	1897.	1896.	Inc.
Miles of road	555	531	24
Gross earn	$2,539,448	$2,202,238	$337,210
Oper. expen	1,957,723	1,798,166	159,557
Net earn	$581,725	$404,072	$177,653

Montrose.—At the annual meeting of the company, held at Mauch Chunk, Pa., Jan. 10, the control of this road passed to the Lehigh Valley, President Alfred Walter being elected President of this road. This line extends from Tunkhannock, Pa., to Montrose, 28 miles, and was built in 1876. The annual meeting hereafter will be held at Philadelphia.

New Orleans & Western.—On petition of the State Trust Company of New York, Judge Parlange of the United States District Court at New Orleans, La., on Jan. 10, placed this company in the hands of C. B. Van Nostrand, as Receiver. This road extends from Port Chalmette to Sarewsbury, La., 14 miles. It has a capital stock of $6,000,000 and funded debt of $2,000,000. The road was built mainly by New York and Boston capitalists.

New York Central & Hudson.—Judge Lacombe, of the United States Circuit Court for the Southern District of New York, has denied the application made on behalf of Charles De Neufville for an injunction to restrain the issue of bonds under the $100,000,000 refunding mortgage plan. (See this column for Dec. 31.)

New York, Susquehanna & Western.—J. P. Mor-

gan & Co., of New York, has purchased the majority of the stock of this road. It is understood that the shares were purchased in open market, and that the interests acquired are 81,000 shares of common stock and 45,000 shares of preferred, leaving 49,000 of common and 85,000 of preferred still outstanding. It is stated that an offer will be made at an early date to the minority holders of these shares. This road has a total mileage of 227 miles, with a main line running from Jersey City, N. J., to Wilkes Barre, Pa., 167 miles, from which are several extensions into the coalfields. The road connects with the Erie at Middletown, and it is understood that it has been purchased for that company to be used in relieving the additional coal business. The Erie, it is conjectured, will turn over to the New York, Susquehanna & Western a large amount of business from the West. The new arrangement will obviate the necessity of numerous changes in grades and curves and additional tracks on the part of the Erie.

Norfolk, Virginia Beach & Southern.—A mortgage was filed in the office of the County Clerk at Portsmouth, Va., by this company to secure an issue of $750,000 five per cent. gold bonds running 50 years from Jan. 1, 1898, to be used in building the extension from Kempsville south to a point near Pungo, Va., about 22 miles, and east from Pungo Ferry to the Back Bay. (See these columns for Nov. 19.)

Oregon Improvement.—The fifth installment of the assessment under the plan of agreement detailed in this column Aug. 20 and Sept. 10 has been called, and is payable on or before Jan. 17. The property of this company was sold at auction for $1,000,000 at Seattle, Wash., Nov. 6, and was purchased by John R. Waterbury and T. Jefferson Coolridge, Jr., representing the reorganization committee.

Pennsylvania Company.—An agreement has been reached with the Drainage Board of the Chicago Canal whereby the railroad company gives a by-pass in the widening of the channel of the Chicago River for the annual rental of $300,000 per year.

Peoria, Decatur & Evansville.—The second mortgage bondholders' reorganization committee, of which M. L. Scudder is Chairman, has fixed Jan. 20 as the limit for the deposit of second mortgage bonds under the plan of re-organization given in this column for June 4.

Pine Bluff & Arkansas River.—This company has been newly organized, with a capital stock of $200,000, to take over the property of the Pine Bluff & Eastern, which was sold at public auction at Pine Bluff, Ark., Jan. 5, to J. M. Taylor, as Trustee of the stockholders and representative of this new company. This road extends from Rob Boy, Ark., to English, 23 miles. It was chartered in 1884 as the Pine Bluff, Monroe & New Orleans, and opened in October of that year. It was reorganized under the name of Pine Bluff & Eastern in 1892. A receiver was appointed Sept. 28, 1895. The officers of the new company are to be found in another column.

Raleigh & Gaston.—The Mercantile Trust & Deposit Co. of Baltimore, Md., is paying the 8 per cent. first mortgage bonds ($1,000,000 outstanding) which mature Jan. 1. This trust company purchased in April last $1,200,000 of new 5 per cent., a part of which will be issued in payment of the old bonds. (See this column for March 12.

St. Louis & San Francisco.—The $1,500,000 first mortgage 5 per cent. gold bonds on the Southwestern Division, offered in New York Jan. 10 at 92½ and accrued interest, were largely over-subscribed the first day.

St. Louis, Chicago & St. Paul.—First and second mortgages were filed in the Recorder's office at Springfield, Ill., Jan. 7, in accordance with the plan authorized at the meeting of the stockholders at Springfield, Oct. 30. The first mortgage was for $1,500,000 to secure six per cent. 30-year gold bonds, and the second for $1,235,000 to secure non-cumulative six per cent. bonds. The line extends from Springfield, Ill., to Granite City, 102.1 miles, with a branch to Grafton of 8.4 miles.

San Antonio & Gulf Shore.—A motion has been filed in the Thirty-seventh District Court, of Texas, by William Davis and other stockholders, asking that the sale of the road be set aside and the property restored to them. This action was begun several months ago. (See this column for June 25). It is claimed that of the purchase price of the road, $113,500, which was due Dec. 15, 1897, is unpaid, and that the Court has extended the time of payment, but without interest. The petitioners want to have the receiver authorized to bring suit against the Construction Company, and the purchasers and trustees for rents, profits, and funds collected. This road was projected to run from San Antonio, Tex., to Velasco, 200 miles, of which 40 miles from San Antonio to Stockdale has been completed. The road was purchased under foreclosure July 7, 1896, by Oscar Bergstrom, Trustee, who obtained possession Dec. 15 following. The newly organized company completed 10 miles of the road to Stockdale last Summer. (See this column for Aug. 20).

Southern.—Charlottsville & Rapidan bonds to the amount of $13,000 have been drawn for redemption at the office of the Philadelphia Trust, Safe Deposit & Insurance Co., of Philadelphia, interest ceasing after Jan. 1.

Southern Indiana.—Official notice is given that this road, formerly the Evansville & Richmond (see this column for Dec. 3), was reopened for freight and passenger traffic Jan. 10, and that all restrictions covering the road at Bedford, Ind., have been removed. The road extends from Elnora, Ind., east 101.4 miles to Westport, and was sold under foreclosure at Washington, Ind., March 23, to the Farmers' Loan & Trust Co., of New York.

Texas & New Orleans.—The Atlantic Trust Company calls for proposals up to Feb. 2, for sale of $26,000 of first mortgage bonds, maturing Aug. 1, 1905, on this line of the Southern Pacific. The payment is to be made from the sinking fund of the company at a rate not exceeding 10 per cent. above par.

Toledo, St. Louis & Kansas City.—The American Surety Company is pressing a claim for $344,000, and threatens, unless payment is made, to apply to the Circuit Court of Indiana for authority to sell the road to satisfy the claim. The Receiver states that $19,434 has been paid on this claim and he has $100,000 available from the earnings of the road. He asks instructions from the Court.

Union Pacific.—On Jan. 5 the Reorganization Committee made to the United States Treasury the last payment in satisfaction of the Government mortgage by check for $8,528,401. This entitled the reorganized company to take possession of the road. There is about $1,500,000 of the overdue first mortgage bonds to be paid off, the holders of which refuse to assent to the terms of the Reorganization Committee and deposit their bonds. The Master in Chancery has fixed upon Jan. 20 as the date of payment of these bonds, the rate being 103½, which includes interest from the time when they fell due. (See this column for Dec. 19.)

Utah Central.—This company was incorporated with a capital stock of $250,000, in Utah, Dec. 29, as successor to the Old Utah Central, including the Salt Lake & Fort Douglass, and the Salt Lake & Eastern, which were absorbed by that road. The properties covered by the new company will include the section from Salt Lake City to Park City, 32 miles, with branches from Park City east seven miles and from Salt Lake City six miles. The old company had a franchise to build eastward from Park City, but this will be passed over to the new Utah Eastern, whose incorporation is given in this column. This road was offered for sale on May 8, and an option given by the Rio Grande Western to purchase it for $550,000 in bonds. The offer was accepted and the transfer made last December. (See this column for Oct. 1.) The incorporators are: A. E. Welby, W. G. Sharp, F. A. Wadleigh, W. F. Colton, Theron Geddes, E. J. Yard, Robert Harkness, Andrew Howat, L U. Colbath and Charles S. Davis. The officers are W. G. Sharp, President; Theron Geddes, Secretary, and W. F. Colton, Treasurer.

Utah Eastern.—This company was incorporated in Utah, Dec. 29, with a capital stock of $250,000, to acquire the right of way of the unconstructed portion of the old Utah Central. The route extends from Park City northeast through Moon's Mill, along Wolf Creek to the Duchesne River, thence along Uintah and Ashley rivers to the Colorado State Line in Snake Valley, about 176 miles, with a branch from Davis' Ranch on the main line to a point about two miles west of Heber City, a distance of eight miles. The Directors are S. H. Babcock, Thereon Geddes, Robert Harkness, A. E. Welby and W. F. Colton.

Wabash.—A contract went into effect at noon Jan. 3, with the Missouri, Kansas & Texas for the use of its tracks by the Wabash, between Hannibal, Mo., and Moberly, 70 miles. One train each way per day has been put into service, and it is understood, if the plan proves a success, most of the east and west business of the Wabash will be carried via Moberly and Hannibal instead of via St. Louis.

Wisconsin Central.—This company has been incorporated in Wisconsin, with a capital stock of $25,000 to acquire by purchase or lease the properties of the present Wisconsin Central. The incorporators are: George D. Van Dyke, William D Van Dyke, W. E. Carter, Thomas P. Carter, Charles McC. Anderson and James L. Norman, who are to constitute the Board of Directors to act for one year. The Reorganization Committee, who are proceeding with the foreclosure of the old company, say that they have no knowledge of the purposes of this new company.

Electric Railroad News.

Allentown, Pa.—The case of the Old Colony Trust Co. against the Allentown & Bethlehem Rapid Transit Co., has been disposed of by the Court of Common Pleas, Allentown. The amount involved is over $200,000, and is based upon efforts of the Old Colony Trust Co., as Trustee, to collect a mortgage of that amount given by the Rapid Transit Co. The Court decides that the claim of fraud made by the Rapid Transit Co. in the giving of the mortgage is unfounded. The defendant company is ordered to pay $246,200, mortgage and principal, to the Old Colony Trust Co., $15,000 counsel fees, $5,040 referee's fees, and all the other expenses, within 30 days of the making of the decree, under penalty of having its road sold. The case is to be appealed.

Cincinnati, O.—Judge Taft, at Cincinnati, has decided that the mortgage of the Cincinnati Inclined Plane Railway of Jan. 1, 1879, to Goodman, as Trustee, covers only the three miles of road from Fifth street to the Zoological Garden and its proportion of the company's equipment. The bill for sale under the amended bill of complaint and the intervening petitition of Goodman, Trustee, may be prepared in accordance with the views thus expressed.

Hartford, Conn.—The Hartford, Manchester & Rockville Electric Railroad has opened its Rockville extension.

Lancaster, Pa.—William B. Given, of Columbia, Receiver of the Pennsylvania Traction Co., has assumed the duties of General Manager, and Frank S. Given has been appointed Assistant to the General Manager.

Lincoln, Neb.—The Lincoln Traction Co. has succeeded the Lincoln Street Railway Co. sold under foreclosure Dec. 17 (*Railroad Gazette*, Dec. 24), and has elected officers as follows: President, M. L. Scudder; Vice-President, Wm. Belcher; Secretary and Treasurer, F. H. Carter. New securities will be issued in the course of a few weeks.

New Orleans, La.—The Orleans & Jefferson Railway Co., Limited, has petitioned the Council for a new right of way from Jefferson Parish Line to Canal avenue.

New York, N. Y.—The Dry Dock, East Broadway & Battery Railroad Co., offices 605 Grand street, will commence to operate in an experimental way four of its cars by means of the improved storage batteries made by the Electric Storage Battery Co. of Philadelphia.

Norristown, Pa.—It is reported that the Norristown Traction Co. is to lease the Wissahickon Electric Railway. The Wissahickon Electric Railway has been in operation for nearly five years.

Scranton, Pa.—A formal step toward the dissolution of the Scranton Traction Company, which was merged in the Scranton Railway Co., on Jan. 1, was taken recently when the stockholders of the latter company met, and voted to decrease the capital stock. It will be decreased again next year, and each year until it is wiped out, when formal dissolution will take place.

TRAFFIC.

Traffic Notes.

Bicycles are now carried as baggage (free) on all passenger trains of the Plant System.

The Pittsburgh & Western has put on a daily fast freight train between Pittsburgh and Akron.

A press dispatch from Austin, Tex., Jan. 10, says that the Missouri, Kansas & Texas has agreed to pay 25 fines, aggregating $12,500, for violations of published freight tariffs.

Press dispatches from Galveston report a serious glut of grain. The elevators are full, 1,400 cars are waiting to be unloaded and vessels are ready to take only about 500,000 bushels.

The Managers of the Joint Traffic Association have refused to recommend the allowance of stop-overs at Philadelphia, Wilmington, Baltimore and Washington on through tickets.

Messrs. Hannaford, Faithorn and Day, special arbitrators of freight rates to Mexico, have made a report, holding that the all-rail lines should make rates above the rates by rail and water, on the several classes, as follows: viz, 15, 11, 9, 6, 5, 6, 5, 4, 4, 4.

The New Orleans Bureau of Freight and Transportation, which has been suspended for several months, is to be re-established, and the newspapers say that Mr. Masters, the former Commissioner, who resigned and went into railroad service, will come back.

The Pacific Coast Steamship Co. has notified the railroads that in selling tickets for Alaska this spring, when the gold seekers begin to travel in that direction, they must give notice that the Steamship company may not be able to carry the passenger at any particular time or upon any particular steamer.

The Pacific Coast Steamship Co. has increased the passenger fares from San Francisco to Puget Sound ports to the old basis, $15 cabin and $8 second class. This advance, reported in the daily papers, indicates the settlement of the long-standing rate war between the Southern Pacific Railroad and the steamers.

Shipments of iron ore by water from Lake Superior ports during the season of 1897 amounted to 12,215,645 gross tons, and shipments by rail are believed to have been sufficient to increase the total to 12¼ millions. This is two millions more than in 1895, hitherto the largest year.

A San Francisco press dispatch states that the number of passengers traveling by the Pacific Mail Steamship Company's vessels between San Francisco and Asia during the past year has been about 12,000, which is 25 per cent. more than in 1896. The increase is mostly in first class travel.

The *Detroit Free Press* says that the Grand Trunk has decided to accept for passage the coupons of the new Michigan interchangeable 1,000-mile ticket. It is understood that the Grand Trunk declines to issue and sell such tickets because it is required under the law to ask only two cents a mile.

The Merchants' Association of New York, organized last summer to secure reduced fares for merchants coming to that city to buy goods, has held its first annual meeting. The expenditures thus far have amounted to $52,000. The officers receive no salary. The Association is preparing a handbook of New York City which will cost $60,000. There are now 1,125 resident members. President W. F. King was re-elected.

Judge Speer, in the United States Court, at Macon, Ga., has refused to compel compliance with an order of the Interstate Commerce Commission making freight rates from Louisville to Griffin, Ga., less than to Macon, 60 miles south of Griffin. The Court holds that competition, water and other, existing at Macon, and the larger business as compared with Griffin, justifies a lower relative rate to the farther point.

The Interstate Commerce Commission has extended for one year its order allowing the suspension of the long and short haul law on passenger business between Detroit and the Kootenay mining district, B. C., and also between New England points and Kootanay over the Grand Trunk Railway. The order was granted to allow the roads to compete with the Canadian Pacific, and it stipulates that the rates must not be lower than those of the Canadian Pacific.

The Interstate Commerce Commission has announced its decision in the case of F. E. Calloway, of La Grange, Ga., against the Louisville & Nashville, the Western of Alabama and the Atlanta & West Point. The case involved the reasonableness of freight rates from New Orleans to Atlanta, Newman and other places. The Commission decides that the rates from New Orleans to La Grange are unreasonable in themselves, and relatively, as compared with the rates to Atlanta and the other places mentioned, and are in violation of the long and short haul clause of the act.

Chicago Traffic Matters.

CHICAGO, Jan. 12, 1898.

There seems to be no doubt that the Eastbound railroads, every one of them, have finally become convinced of the foolishness of carrying grain at reduced rates when there is a large supply offered to every road, for it is the universal testimony that rates are now strictly maintained. Representatives of Joseph Leiter have tried everywhere to secure reductions on a thousand carloads of export wheat to New York and have utterly failed. It is said that rates are maintained at St. Louis as well as at Chicago. For the week to last Saturday night Eastbound shipments, according to the Board of Trade report, reached the enormous total of 140,000 tons. Under ordinary circumstances heretofore this heavy movement would have been looked upon as evidence of secret cutting, but now all agree in the belief that it simply means extraordinary pressure of shipments which are to fill immediate contracts and cannot suffer delay.

To-day it is announced that the Joint Traffic Association has formally reduced corn to 17½ cents and other grain to 20 cents, Chicago to New York, and to other points in proportion. On corn for export the 17½ cent basis will apply also from East St. Louis and East Dubuque.

Eastbound shipments from Chicago and Chicago junctions to points at and beyond the western termini of the trunk lines for the week ending Jan. 6 amounted to 121,757 tons, as compared with 105,937 tons the preceding week. This statement includes 82,440 tons of grain, 19,017 tons of flour and 20,300 tons of provisions, but not livestock. The following is the statement in detail for the two weeks:

Roads.	Week Ending Jan. 6.		Week Ending Dec. 20.	
	Tons.	p. c.	Tons.	p. c.
Baltimore & Ohio	6,947	5.7	6,484	6.1
C., C., C. & St. Louis	5,101	4 2	4,608	4 4
Erie	11,389	9.4	8,361	7.9
Grand Trunk	13,826	11.4	8 889	8.4
L. S. & M. S.	18,015	14.8	16,415	15.5
Michigan Central	10,347	8 5	9,472	8 9
N. Y., Chi. & St. L.	13 204	10.8	8,351	7.9
Pitts., Cin., Chi. & St. Louis	15,256	12 5	14,019	13 3
Pitts., Ft. Wayne & Chicago	20,761	17.0	20.731	19.6
Wabash	6,911	5.7	8,517	8.0
Totals	121,757	100.0	105,937	100.0